THE SURVEYOR, ENGINEER, AND ARCHITECT;

OR

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IN ALL THEIR DEPARTMENTS.

BY A COMMITTEE OF PRACTICAL SURVEYORS, ENGINEERS, AND ARCHITECTS, OF MUCH EXPERIENCE AND IN ACTIVE EMPLOYMENT.

ROBERT MUDIE, LITERARY CONDUCTOR.

CONNECTION OF THE ENGINEERING ARTS AND THE PHYSICAL SCIENCES.

"THE eye," says an oriental proverb, "is only for seeing, and the ear only for hearing; but the head should be endowed with all the senses, and with understanding, thought, and reason, to guide them to their proper objects and uses." This proverb has not a more appropriate application than to the planners of great works, and those who are to carry the details into execution. The latter, whatever may be their avocations, whether excavators, builders, carpenters, or any thing else, cannot concentrate their minds too much on their individual occupations, because it is in this concentration that their value, both to themselves and to the public, consists; and it deserves to be borne in mind that, in proportion as the individual occupied in any of these pursuits fairly and honestly does good to himself, he does good to his employers, whether those employers be private individuals or the public generally:—and here the line of distinction is rather a nice one; for individuals share in all the good that is done to the public, and the public share in what is done to individuals.

The advantages of this concentration of the mind upon the one occupation, in all matters of detail, are so obvious that we need not enter into any enumeration of them:—the man who daily uses any tool or implement is most likely to improve that implement; and the man who is engaged in performing or superintending the same kind of labour day after day, and whose ease and profit depend upon simpler and better modes of performing it, is the most likely to find out those improved modes.

This is true in all mechanical operations, be they what they may; and we find some of the most striking illustrations of it in occupations which, to common observation, may appear the most simple. Take as an example the apparently very simple labour of excavation,—as for instance the cutting of a canal, after the exact line has been marked out by the engineer. There is more individual science, or rather *nous*,—for it cannot be made matter of science, and subjected to calculation,—required in this than in very many occupations which in themselves appear to be more complicated. Setting aside the nature of the ground, and the rendering of it water-tight, should such an operation be required, there is a very nice problem to be solved before the excavator can perform his work in the best and cheapest manner. It is the business of the engineer so to lay down the line as that the deep cutting and embanking upon uneven ground shall exactly compensate each other. But, after this has been done, by the most skilful and experienced engineer, and in the very best manner, the excavator still has his problem to solve, and the principal datum on which he must depend for the solution is his own observation, guided by his former experience. This problem is, "to remove every portion of earth, whether by barrow, by wagon, or otherwise, from the deep cutting to the embankment, by the easiest road and the shortest distance, and in such a manner as that not one pound of it shall require to be moved a second time." It is on the skilful solution of this problem that the value of an excavator depends; for one who can solve it with perfect certainty in every case can afford to undertake his contracts on lower terms than a man of less experience and judgment; and he will make a handsome profit at this saving to his employers, while the other would cost the employers more and ruin himself at the same time. This is in fact the grand reason why those excavators who are steady, give their whole minds to the business, and gain experience, seldom fail in making handsome fortunes; and we may add that, in an age of improvements on the grand scale, there is not a more valuable class of men than these same experienced and intelligent excavators. The want of them has been severely felt in the formation of the railways, and has in some cases increased the expense full 25 per cent., and left the work very imperfect after all; but of this it would be invidious to mention instances.

In illustration, however, we may allude to one excavator who acquired his experience long before railways were projected, and who is now unfortunately lost to the world. We mean the late Mr. William Hughes, who, in experience and resource in his profession, and we may add in fairness and success in the performance of it, had few if any rivals. On one particular occasion he was engaged in executing successive contracts upon an extensive canal; and, though he obtained his contracts upon terms satisfactory to the engineer and the commissioners under whom the work was executed, the influential men of the locality—to whom such operations were quite new, thought that, as he certainly was making handsome profits, he was unjustly putting in his pocket the money of others. Upon these grounds they remonstrated with the engineer, who, though a man above all question in respect of honour, resolved to gratify them with a little taste of excavation. Accordingly, he appointed a day, desired them to bring their contractors, with the requisite securities, and he would let them a portion of the line. They came at the appointed time, the contracts were let at a penny or a halfpenny, we forget which, a cubic yard more than any that had been let to the excavator alluded to, and the gentlemen who complained became security for the due performance of the same. Matters being thus settled, the new contractors set their men to work, and their operations were more like those of grave-diggers than any thing else; for each man was digging a separate hole, and throwing the earth on the banks all around. This went not far toward the construction of a canal; but the process was expensive enough; and though more money than was equivalent to the work done—which by the way was not worth a single farthing—had been advanced to these contractors, they soon failed, and were unable to pay their men. The engineer was indulgent, and so he gave them another trial, and a penny a cubic yard more; and, thus encouraged, they again went to work, and made the surface of the intended canal more unsightly than ever, without advancing the real work a single jota. They again failed, and the engineer threatened to call on the securities to make good the damage, though without any intention of carrying his threat into execution. He invited

them to the re-letting of the whole that had been contracted for, in one contract, to Mr. Hughes, who undertook the work, mangled as it was, at three-halfpence a cubic yard less than it had been let to them; at the same time he released them from their obligations, did the work in his usual systematic and masterly manner, and realized a handsome profit by the doing of it.

We have mentioned this particular case, because we are personally aware of its truth, because it can offend or gratify no living man, and yet more especially because it is an absolute demonstration of the immense advantages that arise from a practical man devoting his whole mind to the art which he practises, whatever that art may be. We have instanced only the excavator; but the builder, the carpenter, and every other man who takes an individual department in a great work or works of any kind, is equally valuable in proportion as he devotes his whole energies to his particular department, and so acquires that thorough and ever-ready experience which can neither be purchased nor communicated by one man to another. To all such, that part of the proverb which relates to the eye and the ear is strictly applicable; and the application is far more striking than would at first be supposed. There are many actual instances by which it is proved that the eye,—that is, all the apparatus of the eye necessary for the purposes of vision,—is sensitive to nothing but light; and that the ear—that is, all the parts of the ear essential to hearing,—is sensible to nothing but sound; for a blow on the eye, or the burning it, or any other injury, produces no sensation but that of a flash of light, brilliant in proportion to the violence of the injury; and like injuries done to the ear,—that is, to the actual auditory apparatus,—produce no sensation but those of sounds, loud in proportion to the violence. And when we reflect upon the matter we can see how beneficial this confining of each of these organs to its own specific function is to the owner; for, were they sensible to pain, to changes of temperature, or to any other affections, save those of light and sound, their proper functions would be continually disturbed and paralyzed. Even so, in the case of those who have specific departments of work to carry into execution, more especially when those works are of importance, cannot fail in having their performance paralyzed, and their usefulness impaired, by every extraneous matter which they suffer to break in upon them and distract their minds from their proper avocations.

In this, however, we must not be misunderstood; for, just as the eye, though limited to seeing, ought to see every thing, and the ear ought to hear every thing, so ought the man who follows an individual practical department to be fully master of that department, in all its particulars and details, in all the subjects which immediately bear upon it, and in all the contingencies of time, place, and circumstances, to which it is liable. Therefore, when we say that the excavator, the builder, or any other conductor of an individual part of a work, should devote all his energies to his individual profession, we especially mean that he should devote the energies of his mind to it; because it is by so doing, and by so doing only, that he can acquire that experience and readiness of resource which will enable him to meet and overcome every new difficulty that presents itself; and, be it remembered, that the conductors of extensive works, especially works in the earth, or on the shore, are constantly meeting with difficulties of which they can have no knowledge until they actually arise; and it is in the overcoming of them that the value of the man of experience consists.

When, however, we leave those branches of the work, and the parties who have immediate charge of the execution of them, and turn to the plan of the work itself, we cannot fail to see that he who plans must have a far more extensive range of knowledge than they, or any of them, who carry the details into execution. Not only must he understand the general principles of all that he calls upon others to do, but he must have a general knowledge of the principles of that Nature which is the field of his planning and of their executing, and in obedience to the principles and laws of which they must work, otherwise their working can be of little avail. The common mathematical sciences—those of number, magnitude, and quanty, are as essential to an engineer as his case of instruments or any other part of his apparatus; and, therefore, if he is not expert in them, his mere schooling is unfinished, and he has no business to obtrude himself into any one of the professions, unless to carry a pole, or a flag, or the end of a measuring chain.

The mixed sciences of the schools, in which the more general properties of matter are studied in conjunction with mathematics, are scarcely less necessary; and, if any member of the profession is unacquainted with them, he will make but a very lame hand at his work. The most essential of those mixed or physical sciences are Mechanics and Hydrodynamics, or the sciences of solid matter and water as a liquid, whether in respect of stability or of motion; and the motion of water especially, and of solids through water, together with the resistance which is offered by friction or otherwise in these cases, and its proportion to the velocity, are worthy of direct study and experiment by every engineer. This is not the place for entering upon an examination of any one of the theories which have been laid down, and implicitly believed, upon these subjects; but we may mention that, whenever these theories have been subjected to the test of carefully-performed experiment, they have always been found inaccurate except within a certain range, and that not a very wide one. This has been found true in every case, and especially in that of the motion of solids through water, where, above a certain velocity, the resistance, and the consequent power requisite to propel the moving body, do not increase nearly so fast as is represented by the theory. This is a very important matter, more especially in a country which has so much pelagic, and coasting, and inland navigation; and as such navigation must ever remain the best means of transit for heavy goods at home, and the only means of intercourse with foreign nations, the principles of it cannot be too thoroughly studied, or too frequently and carefully verified by experiment.

The present is a time at which stimulating hints upon this subject seem especially requisite. Nations, like some fond mothers, are apt to neglect their elder children by doting upon the infant. Upon the great scale, the railways are the present infant of engineering,—an infant of goodly promise, we admit, but still the youngest born of science; and, as many of the canals, from injudicious making or management, or other causes, proved very unprofitable speculations, it is probable, nay, certain, that they have of late years sunk lower in the public estimation, and been more neglected, than their real merits deserve, therefore, it is highly expedient that the minds of scientific men should be turned to canals, and the means of their improvement; and we have the satisfaction of knowing that some of the most talented of the engineers in the country have turned their attention to this grand national subject, and turned it in a manner so effectual that they cannot fail in originating much good. Professional gentlemen who are in

first-rate employment, and frequently called to distant parts of the country in the way of their professions, and who, besides this, have every leisure hour occupied in investigations and experiments as to what further good may be done, have generally but little time for writing; and the lines and characters of their books are those public works which adorn the country; but still we hope, nay, we can assure our readers, that in the course of a short time we shall be enabled to lay before them information from the very highest sources, upon the improvement of canals, and of the traction of barges and other craft upon them.

There is also a want of better and more extensive—more directly experimental information, upon the relation between velocity and friction, and the nature and economy of momentum, upon all kinds of roads, of what materials soever they are formed, and whatever may be their gradients, or variations of level. The question is not even clearly settled as to whether, in ordinary cases, it is better to go across a hill of moderate height and slope, or round its base; neither has any plan been put in execution for accumulating the surplus momentum in going down a hill, so as to expend it upon the next ascent. We know that experiments have been made on both these subjects, and that the makers were perfectly competent both to the art and the science of the matter; and we think we shall have no difficulty in finding access to the results. There is another subject connected with road conveyance which is well worthy of attention, and that is the running of iron wheels upon wooden blocks, formed of pine, and set on end, in the same manner as is done in the wooden pavements. It is true that, to make an efficient and durable road of this kind, it would be necessary to lay sleepers, the same as on the present railroads, and also to have iron rails, which rails would require to be made in the form of boxes, to retain the wooden blocks, and, if those boxes were made of a slightly dove-tail form, and each length driven full from the end, they would of course be the firmer and more durable. There is a problem here in which there seems to be some probability, but which can be solved only by experiment. It is this:—What relation will the "bite" bear to the friction, in iron wheels working upon wooden blocks placed end-ways, as compared with the same wheels working upon iron rails? This problem is one wholly of experiment, and no light can be thrown upon it by any theory or reasoning whatsoever, and yet, as we have said, the solution of it is highly desirable. It is the more so when we take into account that the power which can be given to a locomotive engine is unlimited or nearly so, and that, therefore, if such an engine could ascend a steep gradient upon wooden rails of the form we have mentioned, it would make the construction of railways a very cheap matter compared with what it is at present. In the mean time we can only say that this, or some other method by which locomotive engines might be made to ascend and descend inclined planes, would be highly desirable; but, as the data come before us, we shall be enabled to meet the question, in so far at least as a practical one.

These, and many similar questions, are parts of the subject of engineering itself, rather than of those auxiliary sciences of which a knowledge is necessary to the engineer. Those auxiliary sciences it is needless to enumerate, because it is difficult to name any one subject which a thorough-bred engineer ought not to know. The whole of nature is, as we have said, the field in which he is called upon to exercise his talents; and, as it is impossible for any individual engineer to anticipate the situation or circumstances in which his exertions may be required, he ought to be equally prepared for them all. This is the more necessary, because an engineer, especially one of name and celebrity, cannot select his department of the business; and the same may be said of an eminent architect or surveyor. When a work of great importance and expense is to be done, those concerned in it naturally and very properly wish to employ the foremost man of the time; and the very fact of a man's obtaining eminence in any one branch of these professions may, indeed must, call him to exercise his talent in a branch which is quite opposite: thus, for instance, a man who has gotten great celebrity by designing and seeing executed a canal, a railway, or an important bridge, may be next called upon to construct a harbour, to drain a marsh, or to bank out the sea. Refusal on the ground of ignorance on the subject would in such cases be injurious both to the reputation of the professional man, to the interest of the parties concerned, and through them to the public benefit; and the same causes demand that he who has gotten renown by one description of public works should not lose that renown by another. Hence, the engineer, the architect, or the surveyor, as it may be, must be a sort of universal man in his way,—a man to whom all the departments of the profession, and all collateral subjects that bear upon them, are alike familiar. This necessarily brings him into contact with all the departments of nature, and with very many of those of art: with the former, in order to know what is to be done, and how it ought to be done; and the latter, in order that he may see that the contractors and other parties under them carry what he intends fully and fairly into execution. If he is not competent to see that these things are done, and done rightly, his mere planning, and all his skill and neatness as a contriver, will be of small avail, and he will lose ground on the one hand as fast as he gains it on the other.

A knowledge of geology is absolutely indispensable to such professional men; because the earth is both the foundation and the material of all their operations, and, unless they thoroughly understand its local composition for the district on or in which they are employed, they will be in continual danger of error. Thus, for instance, if the work is excavation or embankment, the nature of the material used for these purposes and of the locality in which it is used must be well understood. Indeed, the engineer who works in accordance with the composition of the earth must know something more of the nature of its component parts than the mere geologist, to whom it is an abstract study. The geologist is, no doubt, in so far an instructor, and a very useful instructor so far as he goes, because from his information we learn what we are to expect under the surface of the earth, and at what depth and in what order we may be prepared to find the several strata of which it is composed. In the olden time, a sort of necromancy was used in the pretended discovery of valuable minerals, much in the same way as necromancy has generally been resorted to in all cases of interest respecting which mankind have been in ignorance. But the direct observations of the geologist, and his legitimate reasonings upon the data afforded by those observations, have broken the divining rod of the Rhabdomancer; and no man now pretends to discover coal or any other mineral, hundreds of fathoms below the ground, by simply striking his staff against the surface, as many pretended, and were well paid for so pretending, in times not very long gone by. This is at least one beneficial result of the study of geology, that it has substituted knowledge where there once was quackery, and certainty where all was once matter of conjecture; and, independently of its other results, the world is highly indebted to it on this account alone. Take as an example a single instance: the researches of various geologists, and more especially of the indefatigable Mr. Murchison,

have led to the conclusion that the coal-fields of the midland counties of England, westward of the general summit level, extend northward under the sandstone, and join—in fact are one with, the coal-fields of Lancashire. This is a complete answer to those who once pretended to sum up the years at the termination of which England would be ruined from the exhaustion of this its most valuable mineral.

These are splendid results of a single science, and that, too, an underground one; but the engineer, in his attention to geology, must go further than this. The geologist has not necessarily any thing to do with the economical value of the strata whose positions, order, and volumes he ascertains. But to the engineer many of those strata are materials which he must order to be employed; and, as such, he must inform himself of their natures, and the purposes to which they are applicable. Without this knowledge, he cannot successfully, and in the best and most durable manner, either bank in earth, or build in stone; for, in the case of both of these, he must inform himself not only of the nature of the substance, as he sees it in the earth, or under one particular state of the atmosphere; for he must know how it will stand all weathers,—heat and cold, drought and rain, and all the vicissitudes of our variable climate. From want of attention to this, some of the finest specimens of architecture in the country have crumbled into dust, or cast off yearly exfoliations, just as a snake casts its skin. This is much more the case with structures of comparatively modern date than with those which are considerably more ancient; and there are some situations in which an ancient building preserves the marks of the chisel fresh upon it, while a comparatively modern one is mouldering away. The strength of materials, as against the endurance of pressure, and the toughness of them, as against friction and abrasion of all kinds, are also important considerations with the engineer and the architect, where stone is the material which he employs; and it is only in consequence of possessing this knowledge that he can properly adjust his materials to their respective purposes. This applies not only to stone, but to every material that can be employed, and to every mode or matter by which these materials may be bonded together. Even in the simple case of an earthen embankment, or deep cutting for a road, a railroad, or any other purpose that requires the cut to be kept open, there must be not merely a temporary but a seasonal knowledge of the material used; and the skilful engineer will adapt his work to the worst contingency that can happen. Thus, for instance, if the nature of the soil forces him to form a slope of clay or marl, or any other description of soil which is very absorbent of moisture, and liable to be disintegrated by the congelation of the moisture during frost, he will regulate his base and altitude according to the very worst circumstances that can possibly happen, because by doing this he will make sure of the stability of his work. There are many other branches of natural science, and applications of them, which a member of any of these professions must be well acquainted with, and bear continually in mind; but what we have enumerated are a specimen, and others will occur from time to time, in the course of our future labours. We need hardly add that such remarks as those contained in the present article are not addressed to the established members of the profession; but, at the same time, we would take the liberty of strongly recommending them to the notice of such young men as are aspirants to eminence in either of the professions of surveying, engineering, or architecture. They are also highly useful to the public, in showing them the extent of mental exertion which must be made by those professional men who are their most permanent benefactors.

GREAT WESTERN RAILWAY BRIDGE AT MAIDENHEAD.

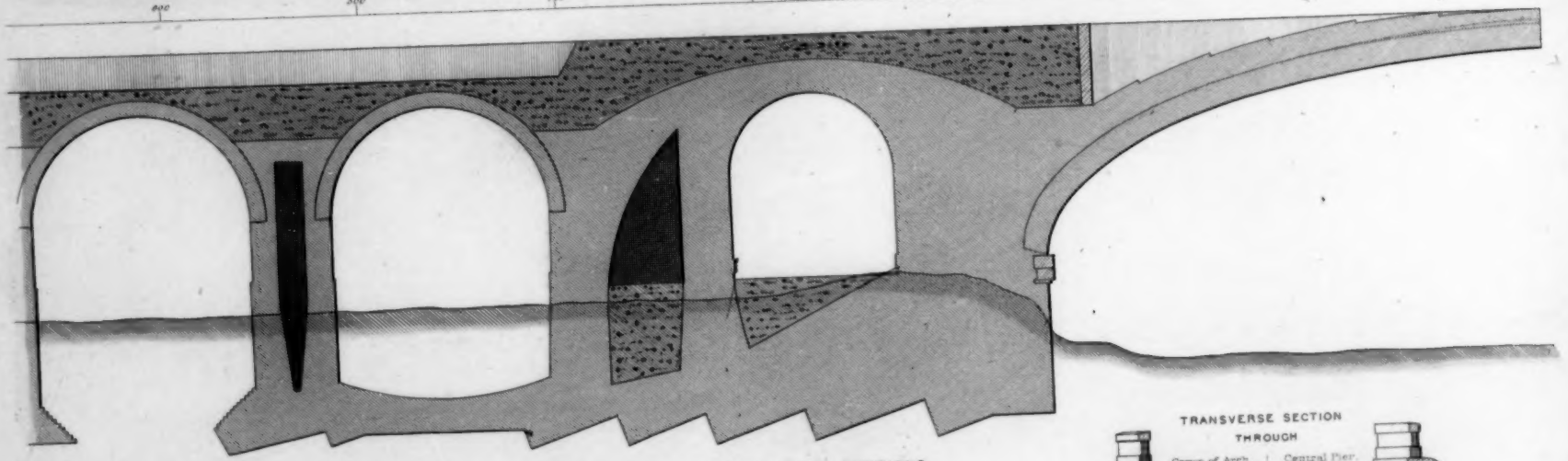
WITH A STEEL PLATE ENGRAVING.

STABILITY OF THE BRIDGE.—In our preceding number we inserted, from a contemporary journal, an account of the alleged state of the Maidenhead Bridge, and gave a promise of full particulars in our next. We now fulfil our promise, and proceed to lay before our readers such particulars of the construction and present state of the bridge as must satisfy every unprejudiced person of its perfect stability. A minute examination, during the past month, of every part of the structure, has convinced us that the gloomy predictions of our contemporary are unfounded, and that the bridge will proudly stand for ages, a lasting monument of the skill and enterprise of its engineers. So far from the arches resting heavily on the centering, as stated by our contemporary, we found that the ribs of both main arches had been blown down by the hurricane of the 24th January, which would not have been the case had the arches rested on the lagging in the slightest degree. The bridge in question, as many of our readers must be aware, is built over the river Thames, at Maidenhead, on the line of the Great Western Railway. The principal feature of interest in the structure consists in its being built wholly of brickwork, excepting the cornice and other ornamental parts, which are of stone; and, when we consider the vast span of the two central arches, and the nature of the material employed, we cannot but regard it not only as a bold but as a hazardous undertaking. Looking at the subject superficially, we should have said such arches could not stand; and we have heard practical men well versed in such matters express similar opinions, after making due allowance for defective workmanship and materials,—which, in such a work, it is next to impossible to avoid. But the arches have been built: that which half the engineering world thought impracticable, Mr. Brunel has actually put in practice. It is true that one of the arches had to be re-built, but that arose from a cause which we always conceived would have been fatal to the experiment, viz., the impossibility of ensuring perfect workmanship, materials, and care, throughout a structure of such magnitude. Previous to the rebuilding, in the latter part of 1838, of the eastern arch—which was the only one found defective, Mr. Hawkshaw was called on to examine it, and he reported "that at the crown of the eastern arch, and for 12 or 14 feet on each side of it, there is a separation between the 1st, 2nd, and 3rd rings of whole bricks, counting from the soffit of the arch: these separations generally are about half an inch wide, and extend three or four yards each way from the crown of the arch. The dislocation appears to be less towards the interior; for, on making a hole quite through the brickwork, in the centre of the arch, it was found that there was a separation only between the 2nd and 3rd rings of whole bricks; but this separation was about an inch in width.

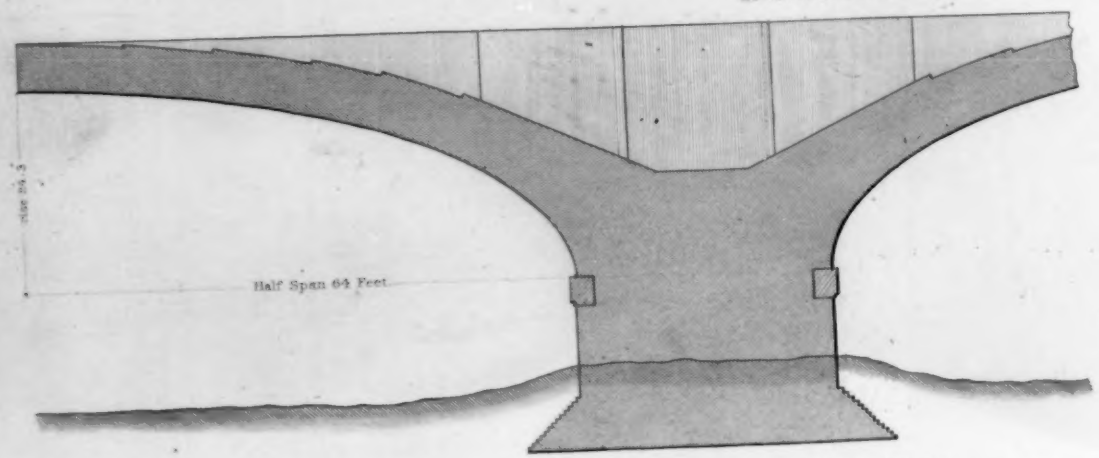
"There is nothing any where that I could perceive like crushing of the bricks, or dislocation, in direction of the thrust. I think it probable, therefore, that if a few iron bolts were put through the arch, so as to prevent any further separation, and the crown of the arch loaded with additional weight, that the bridge might stand, and perhaps be quite strong enough for any thing that may ever be required of it. But I cannot say that I should advise such an experiment to be made on such a structure, especially as putting its stability beyond all question will not be a very serious matter. I should, recommend therefore, that from 25 to 30 feet of the crown of the eastern arch be taken out—the precise quantity will be seen

THE MAIDENHEAD. BRIDGE. GREAT WESTERN RAILWAY.

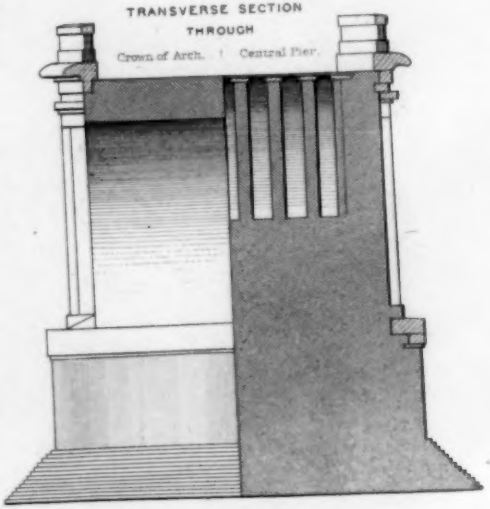
I. K. BRUNEL. ENGINEER.

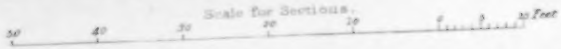


LONGITUDINAL SECTIONS



TRANSVERSE SECTION
THROUGH
Crown of Arch. | Central Pier.





Engraved by J Saddler

London Published for the Proprietors by Grattan & Gilbert, 51 Paternoster Row, March 1840

as the arch is opened—and replaced with stone: the facing of the elevation may still be of brick, so as not to destroy the appearance of the bridge. The stone will give greater weight to the crown of the arch, which, I think, is wanted; and I should also recommend an additional weight to be placed on the crown of the western arch—a couple of courses of 8 or 9 inch landings would do; for I find difficulty in accounting for the appearances presented, otherwise than on the supposition that the haunches of the arches have had more than their full share of load: and, at all events, I am of opinion that some additional weight on the crown of both arches will be of service, and will add to the general stability of the structure." Mr. Brunel reported, on the same subject, "that the work in the eastern arch was defective, and had been condemned by him, and the contractor called upon to replace it." Mr. Nicholas Wood also reported on the condition of the bridge, and observed "that after minutely examining the state of the arches, and the plan of construction, the cause of its failure appeared to have been occasioned by the centering being prematurely drawn, and before the cement was perfectly hardened and had taken a set in the interior of the brickwork forming the ring of the arch." From a comparison of these three reports, it seems to us that the failure of the eastern arch arose from defective workmanship, coupled with carelessness; in which opinion we are fully confirmed by the rebuilding of the same arch without alteration of plan, and which now stands perfectly well, not the slightest change from the true form in the curvature of the arch being perceptible.

In one or two places in the spandrill walls of the land arches slight fissures are visible, but which cannot in the remotest degree affect the stability of the structure. In the north-west spandrill of the eastern arch, also, a slight disruption of the brickwork has taken place, but which appears to be little more than a flushing of the joints. In the whole structure nothing like a crushed brick is to be seen; and, from a careful examination of the faces and soffits of the main arches, we can have no doubt of their perfect soundness.

Descriptive Particulars of the Bridge. — The whole structure consists of ten arches; two main or principal arches of 128 feet span each, with a 21 feet towing path arch, and three 28 feet land arches on each side. The foundations of the whole bridge are laid on a stratum of chalk, about 20 feet below the surface of the ground. The principal part of the abutments and piers subject to the wash of the river are built in cement. The two main arches are turned in half brick rings, set in the best Roman cement. The thickness of these arches at the springing is 7 feet 1½ inches, gradually lessening by offsets to the crown; midway between the springing and crown, the thickness is 6 feet; and at the crown, 5 feet 3 inches. On the face of the main arches, ten half brick rings only,—3 feet 10½ inches, are visible, the remaining thickness being hid by the spandrill walls. The rise from the springing line to the soffit of the main arches is 24 feet 3 inches. The thickness of abutments, 18 feet 8 inches; of central pier, 15 feet; of towing path arches, 4 feet 1½ inches; of land arches, 1 foot 10½ inches; of the piers to land arches, 10 feet: depth of footings of the piers to land arches, 4 feet 6 inches; of the footings of pier between main arches, 6 feet; height to which the pier is carried up solid, 32 feet. The English bond has been observed in the greater part of the work. The ornamental pilasters are of brickwork. Heavy trains have been for months past running over the bridge many times daily, without producing the slightest prejudicial effect.—Further particulars are considered unnecessary in this place, as the reader, by referring to the accompanying Specification of the work, will find every requisite information.

SPECIFICATION OF THE MAIDENHEAD BRIDGE OVER THE RIVER THAMES, ON THE GREAT WESTERN RAILWAY.

This contract comprehends the construction of coffer dams, and generally the supply of all labour, tools, and materials, and the execution of all the works necessary for the entire completion of the bridge, according to the accompanying drawings, and subject to all the terms and conditions of the following specification, together with the execution of such extra work connected with the bridge as may be required by the engineer, and the maintaining the same in perfect repair for twelve months after the entire completion.

The drawings referred to in the specification are three in number, and are marked Contract No. 6, L.

The land enclosed by a red line (not shown) will be procured by the Company, and upon the contractor being put in possession of this land, or of such parts of it as the engineer may consider necessary at the time for the progress of the work, and on notice being given to the contractor to that effect, he will be required, immediately, and before using or occupying any such land, to enclose the same with a temporary fence, and drains, in the manner hereafter described.

During the construction of the abutment on the east side, and before interfering with the existing road and tow-path, a good and sufficient diversion of such carriage-road must be formed and maintained within this abutment, and properly enclosed with fences, and a temporary tow-path must be carried out upon piles in the manner hereafter described.

The foundations of the abutment, land arches, and wing walls, on the west side, and the channels or waterways connected with the river, must be commenced and completed as quickly as possible, in order to afford free passage for the water, in lieu of the obstruction which may be caused by the coffer-dams. When the arches are completed the spandrill walls must be built and carried up to receive the stone cornice.

The centres shall not be struck until both arches have been completed at least two months, and all the spandrill walls, and the whole of the brickwork of the abutment, as far as the line A A, drawing No. 3, (not shown), and the concrete upon the abutment, shall have been completed at least three weeks; and the cornice and parapets shall not be commenced until the centres have continued struck, and the arches left entirely free, at least two months.

Particular Description of Works.—The temporary fencing will consist of good split oak posts, and three oak or larch rails, well and securely fixed, and in every respect sufficient to protect the adjoining lands from trespass, and effectually to exclude all sheep or other cattle from the works: this fence must be maintained until the entire completion of the works. Good and sufficient drains must be formed, for the purpose of draining the ground to be used in this contract, or for the purpose of maintaining the drainage of the surrounding ground which may be interfered with.

Temporary Towing Paths.—During the whole progress of the work the contractor shall be bound to provide such towing paths, fender-rails, and other conveniences, as may enable the trailing of barges to be carried on without interruption, and without the necessity of letting go the tow-rope. A substantial towing path, of not less than 5 feet wide, must be formed upon timbers and carried out beyond the coffer-dam of the east abutment: such tow-path to be either covered with gravel or otherwise, and in every other respect rendered fit and safe for the use of horses.

Coffer-Dam and Centering.—Good and substantial coffer-dams must be constructed, both for the abutments and the centre pier, of sufficient dimensions to enable the foundations to be cleared out to the chalk, (which is about 20 feet deep below the upper surface of the towing path) for a space of not less than three feet all around the footings of the brickwork.

The coffer-dams must be chalked, or puddled, and rendered perfectly water-tight, and raised above the level of the highest floods, and ample means of pumping must be supplied, so that at all times during the construction of the foundations, and until the work has been carried up above the present level of the tow-path, and has been completed to that height for at least one month, the whole of such work shall be kept perfectly dry and free from water.

No part of the coffer-dam must encroach further into the river than the red lines, drawing No. 2, (not shown), and a clear height at least equal to that drawn by the red lines must be left under the centering.

Centering.—The centerings of the main arches must consist of 7 distinct ribs for each arch, placed at 5 feet apart from centre to centre, with six inch lagging. The whole of the centering to be of the most substantial description, in point of materials and workmanship, and to be capable of bearing the superincumbent weight of brickwork, as the work proceeds, without sensible flexure. The centering may be supported by piles driven in the river, provided at least fifty-two feet of the clear navigable water-way be left next to the temporary tow-path; and good and sufficient booms and fenders must be provided and maintained, so as effectually to protect the piles and coffer-dams from any blows or shocks from the striking of barges, and at the same time to prevent injury and inconvenience to the navigation. There is no navigation under the west arch, and consequently less precaution will be necessary.

Every provision must be made to secure perfect and easy means of partially, or wholly striking the centering, and restoring the same if necessary.

The centres of the small or land arches must be proportionably strong, and adapted to their purposes. All the centres of these arches must remain in place until the main arches are closed in, and must then be struck, commencing at the extremities, before the centres of the main arches are relieved or eased in any degree.

Foundations.—The whole of the foundations must be cleared out to the chalk; the excess of material not required for filling in again, being carried to spoil on the site of the centre part of the embankments, which will be formed up to the bridge.

The surface of the chalk must be removed, and cut to the forms shown in the drawings; drains must be cut, and every other precaution taken to keep the surface of the chalk perfectly dry during the construction of the foundation.

The surface of the ground on the east side of the river must be restored to the level of the surrounding ground; the top soil, before removal, being replaced and properly turfed, or sown with rye grass and clover seed mixed in equal quantities, and with not less than five pounds of the mixed seed per acre, and any part which may appear to require it, until the expiration of the term of the contract, must be immediately turfed or sown afresh. The old road and towing path must be restored and formed through the arch in the abutment: such new part of the road to be not less than 20 feet wide, and formed with good materials, and in every respect fit for a good carriage-road. On the west side of the river, a channel or water-way is to be formed on each side of the bridge, connecting with the river, and carried under the land arches, of the form and dimensions shown in the plan, and which dimensions are measured on the level of the underside of the string course at the springing of the arches; the outer sides being formed with a slope of two to one, and the bottom formed to a depth of six feet below the line of string course before referred to. On the outside of this channel, above and below the bridge, a bank must be raised to the level of the upper side of the same string course, which bank must be three feet wide at top, with slopes of two to one on either side, the surface of such banks being soiled and turfed, or sown as before described.

[*Conclusion of Specification in our next.*]

PROPORTIONS OF BEAUTY IN SIMPLE FIGURES.

In ordinary architecture, whether that of detached buildings or continuous rows in streets, and whether in the exterior or the interior, the rectangle is the principal figure which occurs, and in many respects it has advantages over most others. It is somewhat singular, however, that not only common builders, but architects of eminence, appear to have no principle of beauty upon which to regulate the proportions of the rectangles they employ. In consequence of this, we have, some buildings,—as, for example, the Bank of England, and, to a certain degree, the National Gallery,—so disproportionate in height to the length of the front, that they seem not only dwarfs, but actually dwarfed below their real dimensions. In other cases, again, we have a building with small extent of frontage run up to such a height that every appearance of stability is destroyed, and one feels alarmed least every gust of wind should blow it down. It is true that in London, and other crowded and populous places, where ground is of great value, there exists a strong temptation to this disproportionate height of buildings; although in the new erections of some of the greatest thoroughfares, one step at least has been made to a better taste; and time may bring about another, more especially with the stimulus of such examples as that splendid building of which the elevation is given in our first number.

Our present purpose, however, is not to criticise buildings, but to inquire into the principle of beauty in the proportions of rectangular surfaces or apertures. The square may be taken as the fundamental rectangle, from which all the others are deviations; and any one who studies a square will find that the impression which it leaves on the mind is that of strength without any beauty. A detached building with a perfectly square front, the face of a square dado of a column, a square window, or, in short, any square which tells distinctly either as a piece of matter or as an opening, will be found to give an impression of strength, but without any mixture of the feeling of beauty.

Again, the very same surface as the square presents, that is, the same measure of surface, may be represented by a countless number of rectangles, until at last the length becomes indefinitely great, and the breadth indefinitely small, and the surface ceases to be a quantity admitting of numeral expression,—the well-known principle of equality in surface, among all these rectangles, being the product of the length and breadth always the same. When the ultimate rectangle vanishes into a line, the elements, and consequently the idea, of strength is completely lost; and the line expresses almost weakness or instability, which has just as little of the expression of beauty in it as the square, which expresses absolute strength.

It follows from this, that the beautiful figure is to be sought for somewhere intermediate between these; and the question to be solved is, what are the proportions of this figure. We have said that the practice of ordinary builders and of many architects shows that with them this question is altogether indeterminate; and so they

apportion the length and breadth—say, for instance, of windows, according to chance or custom, or to one knows not what. The result is that we find one building with windows so narrow in proportion to their height that they appear like vertical fissures in the wall; while other openings are so low in proportion to their breadth that one feels as if the intermediate walls had been crushed down by too severe a load.

As beauty is not a feeling that can be clearly referred to any mathematical or physical basis, we can find out the dimensions of beauty only by analogy; and this analogy, even in the simple case of the rectangle, is a matter of some difficulty, or at least the clue to it is not quite self-evident. When however we begin to consider the endless series of rectangles between the square and the interminable straight line into which they ultimately vanish, we find that there is one among the number which possesses properties that neither are nor can be possessed by any of the others; and this is the most likely one to be the rectangle of beauty.

This rectangle is the one which, though bisected continually, shall have all the sections of the same proportionate shape—that is, the breadth of each of them exactly the same fraction of the length as in all the others. It is not difficult to see what must be the proportions of this rectangle; for, as the whole and the half of it are similar, and as the corresponding sides are similar figures, are proportionals, we have this analogy:—

As the length of the rectangle
is to its breadth;
so is the breadth
to half the length: Therefore,

if the length is given, the breadth can be found; or, if the breadth is given, the length can be found, and consequently we have the means of constructing the rectangle of any dimensions we please, by having one of those dimensions given.

By the well-known property of proportionals, the above analogy forms this equation:—the square of the breadth is equal to the length multiplied by its half; or, calling the length 1, the corresponding breadth will be the square root of ½. The square root of a fraction being always a greater number than that fraction itself, the breadth of our rectangle must be more than half the length; and, in order to determine how much, the most convenient method is to reduce them to the corresponding decimal, ·5, and extract the square root by the ordinary operation. Upon doing this, we find the square root of ½ comes to ·7071; so that, if the length of the rectangle is 1, the breadth must be this decimal number extended as far as may be necessary; or, if we annex as many 0 to 1 as there are figures in the decimal, we have the proportion:

Length, 10,000; breadth, 7,071.

These numbers are too large for common purposes and, as the second figure of the breadth is 0, it will be quite near enough to take the approximate dimensions,

Length, 10; breadth, 7:

and, by means of these, we can find by simple multiplication and division the length answering to any breadth, or the breadth answering to any length: and, if a rectangle is actually constructed having these proportions, it will be found much more handsome, whether placed to stand on the breadth or on the length, than any rectangle of a different shape. We need hardly add that the length may be found mechanically if the breadth is known; for, by the well-known property of a square, if the breadth be equal to the side of a square, the length will be equal to the diagonal of the same.

As an example of the application of this, we may mention that if a window is made of these proportions, and divided into the same number of panes, in height and in breadth, those panes will not only be all equal and similar, but they will be similar to the general aperture of the window itself; and the dissimilarity of common windows and their panes is deformity which obtrudes itself upon one in viewing almost any building. In the case of what is called a French window, opening in two leaves, a very handsome one may be obtained by four large panes, or one of greater strength, and still beautiful, with four panes in each leaf, lying on their length.

The same principle is applicable to the circle, and the countless series of ellipses between the circle and the interminable straight line into which the final ellipse vanishes; but this, together with the illustrative diagrams, we shall reserve for a future number.

ARTIFICIAL RESERVOIRS AND THEIR USES.

In many parts of Britain, and in the south and central portions of England especially, vast quantities of rain seasonally fall upon the downs and other heights, from which they speedily flow away without producing any permanent good. Indeed, instead of good, they are ministers of evil; for they wash away the more valuable particles of the upland soil, and carry them down to form banks in the sea, without enriching the interjacent country. The quantity of rain which so falls varies greatly in different localities and in different seasons, so that it would not be easy, or indeed possible, to make anything like an average estimate of it. It is certain, however, that water, and especially rain water, which is purer than any other, is in every respect a substance of great value. It is so, not only from the stimulus which the judicious application of it gives to vegetation, but for the application of it as a power for turning local machinery, and in many manufacturing and domestic operations.

It has occurred to us that a little judicious management and well-expended capital might convert the water, which now serves only to scourge the land periodically, to purposes of the greatest practical utility. The method of doing this would be to form large reservoirs, rendered water-tight by puddling if necessary, upon the different heights in the country, but not upon the very summits, which are generally at a considerable elevation above the water shed in the passes between river and river. If such reservoirs were made of sufficient dimensions,—and they could be made upon land which is now worth very little,—stores of water might be collected in them which would be highly useful both in assisting the labour of the people, and in promoting vegetation. No doubt, in order to render such applications as efficient as possible, it would be necessary to have reservoirs of ample dimensions; but then, by hypothesis, the grounds which such reservoirs would occupy are at present of very little value, and, consequently, the land for the reservoirs might be cheaply obtained. Not only this; but the reservoirs themselves, if once properly planned, might be made by the people of the several districts at those seasons when they have little else to do; and, once made, they would require very little further expense. The uses, on the other hand, would be many; and perhaps there are few projects which would add more to the real benefit of those parts of the country where such reservoirs would be most desirable. In the first place, they might enable canal communications to be continued from one river valley to another, in situations where, solely from want of water to work the locks, such continuations are not now practicable. In the second place, they would form stores of water for irrigating the surface of the land, and for various other purposes, during the dry season of the year. In the third place, they might be rendered

available for working machinery in situations where there is now no water-power, and where, from the expense of coal, the employment of steam engines is out of the question. In the fourth place, they would greatly add to the fertility of the neighbourhoods in which they were situated. At present, the dry heights of the country are to a great extent burnt up every season, and the action of the sun upon them, which is in itself one element of fertility, is completely lost for the want of water, the other necessary element. The immediate banks of the reservoirs would, like the banks of lakes, be favourable for the growth of timber; and this timber, besides its own intrinsic value, would break the current of those bleak winds which, in the winter months, now scourge the naked heights with so much destruction. Then the evaporation would spread around; and the vicinity of one of those artificial reservoirs would exhibit the same fertile appearance as is seen in the vicinity of a mountain lake, even when that lake is situated at a far greater elevation than would be required for any of these artificial sheets of water. Such are a few of the advantages which would result from turning to useful purposes a certain portion of those waters which now fall upon the surface of the high grounds only as a means of impoverishment here, and of havoc and destruction elsewhere. Of course the localities for them would not be exactly the hill-tops, but certain surfaces a little way down the slope; and some judicious surveying would be necessary, in order to find out the situations most appropriate for them, as well as the best methods for their construction. The chalk districts are places in which they would be eminently desirable; because, though plenty of rain falls seasonally on those districts, there is often a deficiency of water even for the drink of domesticated animals during the dry season. Further, when it is considered how greatly the value of land is increased by converting it into water meadows, and how much the number of such meadows might be augmented by this artificial means, it will at once be seen that the project is very far from being a visionary one. The extremes of climate and of seasons are much less violent in any part of England than they are in the most favourably situated spots of Southern India: and such reservoirs as those to which we allude might be filled half a dozen times in the same number of months that the Indian tanks are filled once; and yet, by means of their tanks, the people of Southern India once converted into a highly fertile land, rich in all kinds of agricultural produce, vast tracts of country which, since it was desolated by wars, and the tanks neglected by the people in their wretchedness, has now become a thirsty and unprofitable desert, not reclaimable by any expense which the people in their present condition can bear. It may seem a novel project to treasure up water in such a dripping climate as that of England, but it is one which, carried properly into effect, would add greatly to the productions and wealth of the country.

PETERBOROUGH A PORT.

CONSIDERATIONS ON SIR JOHN RENNIE'S PLAN FOR IMPROVING THE NAVIGATION OF THE RIVER NENE, ETC. BY TYCHO WING, ESQ.

This is a sensible and temperate pamphlet, of the appearance of which we gladly lay hold as the means of enabling us to offer a few remarks on the highly important subject to which it refers.—

That the drainage of fens and marshes, the reclaiming of rich estuaral banks from the sea, the turning of stagnant ditches into tidal channels, and the bringing of tide navigation as far into the "bowels of the land" as possible,—that these are among the most valuable departments in the whole wide and varied field of engineering, is so self-evident that any attempt to prove it would be quite superfluous. Every one who has paid the least attention to the subject, or who will reflect even for a moment upon it, must perceive that a fen or marsh robs the land and poisons the atmosphere all around. It acts as a sort of receptacle for all those lighter and richer particles of the soil, which are blown by the winds, or washed down by the waters; and though, by this means, the soil which it contains is rich, the fineness of the particles renders it impervious to water, and it becomes covered with miry pools just in proportion as it is rich. The stagnant water encourages an unwholesome vegetation; and what with the decay of this, what with the number of insects and other small animals that are decomposed in it, there are pestilent miasmata in the air which blows from it, independently altogether of its humidity and cold. When, however, a drainage is effected, the pestilent atmosphere is at an end, and the unprofitable marsh or fen becomes land of the most valuable character. There are many examples of this in England, and, indeed, in all countries where man has paid any thing like proper attention to that land the produce of which is his only means of subsistence.

In estuaries favourably situated, nature performs this operation without the aid of man; and many of the naturally richest districts in all countries have been formed by the slow and gradual operation of the rivers. But in the case of a marsh or fen it is otherwise. There is no principle of amelioration in either of these. On the contrary, the evil has a tendency, not only to perpetuate itself, but to spread; and though the climate may not be favourable to the growth of mosses and the accumulation of peat, yet the fen or the marsh becomes every season more and more impervious to humidity; and so the stagnant water continues year after year. Human skill and industry are requisite in all such cases; and there are none in which the reward is more certain, abundant, or immediate. This is so well exemplified in all the reclaimed fens, bogs, and marshes in the kingdom, that to enlarge upon it would be superfluous. The grand English example, however, is that of the district around the Wash, on the lower courses of the Ouse, the Nene, the Welland, and the Witham, called by way of eminence, "The Fens," in like manner as the streams alluded to are called the "Fen Rivers."

The neighbouring grounds, and such parts of the fens themselves as have been properly drained, are among the richest grazing lands, and even tillage grounds, in England; and, though the drainage is in many places very imperfect, they are in a state of improvement, the acceleration of which is an object of great national importance, because every man who lives on the produce of the land is a sufferer by every cause which lessens that produce; and while people complain of the high price of corn and the other necessaries of life, they have equally just cause to complain against every portion of soil capable of being rendered productive which is left in an unproductive state.

When the fen or marsh intended to be drained and brought into a wholesome state abuts on the sea or a tidal bay or estuary, the drainage can always be more advantageously made than under any other circumstances; and this holds good with regard to the purifying of the air, as well as the improvement of the soil. If not above low water mark, there can of course be no tidal drainage; but, by proper management, such a drainage may be obtained, though the general surface is below high water. In such a case, however, there must be sluices, and the working of them is a constant expense. But when the surface is not lower than the high water level, the whole advantage of the tidal drainage may be obtained.

This is the case with most of the fine lands on the Wash; and,

although some of the additional ground proposed to be reclaimed by the general plan of Sir John Rennie for improving this part of the country be now considerably below the high water of spring tides, yet it may be brought up to within a moderate distance of that by skilful "warping;" and much has been done by means of this operation, both in the fen rivers and those which fall into the Humber.

The grand point of the whole, however, is the tidal drainage; and, from the experiments hitherto made, upon a comparatively minor scale, there seems little reason to doubt that this operation, if properly carried into effect by the concentration of all the fen rivers into one outfall, would produce not only a valuable navigation in that outfall, and a drainage of the land more complete than has hitherto been effected, but that it will also cut through the banks which have been formed in the Wash, and so produce and keep open a sea-passage capable of admitting craft of much greater burden than have hitherto navigated those seas, and far more straight and free from hazard than any of the ship channels which now exist in this very peculiar bay. Upon this part of the subject we shall not however enter at present, because our readers must look upon this as merely a preliminary paper, in which we have broken ground upon one of the most interesting subjects within the whole range of British engineering. When, however, we come to consider Sir John Rennie's extended plan,—and we must say it is an admirable one,—for the general improvement of the lower portions of the fen rivers, and the combining of them all into one common outfall, we shall be better enabled to treat this subject with that attention which its importance deserves.

Meanwhile, our principal object is, to notice the great advantages that would result from rendering the Nene navigable for keels and other coasting craft of at least 80 tons burden, all the way to Peterborough at all times of the tide, and for vessels of much greater burden at spring tides. The idea of this has evidently been derived from the success which attended the new outfall of the Nene, for the six miles between Wisbeach and the sea. Formerly, while the old and tortuous channel was the only outlet for the water of this fen river, the ebbing out was trifling as compared with what it is at present; and the navigation of the tortuous channel was tedious, uncertain, and fit only for craft having but a very small draught of water; but when the new outfall was made, and the river turned freely into it, the scour in that outfall cleared an additional depth of about ten feet, and the tide ebbs upon the average ten feet more in the river than it did formerly. In this there is a double advantage:—First, the greater burden of the vessels which can come freely to Wisbeach in ordinary states of the tide; and, secondly, the ten feet more drainage which the fens have at low water. The first of these advantages admits of calculation, in the more abundant and cheap supply of such articles as the district requires, and the more free exit for its produce; but the benefit of the latter is almost incalculable, inasmuch as the additional ebbing back of the tide, aided by a judicious system of drains, must completely take away the fenny character of the approximate lands, and enable them to be turned into healthy and highly-productive pastures, or into rich corn-fields, according as the one or the other may be the more desirable.

The proposed extension of this navigation as far as Peterborough, which is about seventeen miles on the straight line, would be of immense advantage to this very rich district of country, both in the way of the drainage of the land, and in that of the import of such necessaries as are required, and the export of the produce of the country itself. In round numbers, this navigation would bring coals, and other sea-borne commodities, into the centre of a circle containing about 900 square miles, or 576,000 acres, and would give the agriculturists an exit for their surplus produce, with not more of land-carriage in any direction than seventeen miles. The advantages of this would be immense—more than any one could imagine who is not acquainted with the extreme productiveness of this part of the country. The only obstacles are the contractions and irregularities of the river in passing through the town of Wisbeach, and some other situations, and the removal of these would not be a matter either of much difficulty or expense. There might be some opposition on the part of the inhabitants of Wisbeach, who might suppose that the conversion of Peterborough into a port would be injurious to their local interests. This, however, is a narrow view of the case, and one which is unworthy of any Englishman who loves his country; and this we may suppose,—that, in the present enlightened state of the public mind, much stress will not be laid upon it by any man who wishes to stand well in the eyes of his countrymen.

From all that we can gather on the subject, there will be a fall of between three and four inches in the current of the river Nene, all the way from Peterborough to its confluence with the sea; and this fall, inconsiderable as it is, will, as is presumed, prevent the accumulation of mud in the channel, from the unseemly stagnation of the seasonal waters. Upon the whole, we look upon this as one of the most beneficial schemes that ever was brought before the legislature, and, as such, we wish the execution of it every success. Our limits are however more than filled up, and therefore we leave the objections to the work to those who, with more pretence to finery, are not so seemly in their apparel as the gentlemen connected with the Surveyor, Engineer, and Architect. But, though we differ from them on many points, we apprehend that we are all agreed as to the general advantage of such works as those we are now enumerating. We are now only enunciating a general question, but we shall in due time proceed to the illustration; and, while we do so, we trust we shall be enabled to show that England owes more to the engineering arts than to any other application of skill.

ROYAL EXCHANGE COMPETITION.

By this time it is probably discovered that double the time might have been allowed, in the first instance, to competitors, for duly studying the subject, as well as preparing drawings, since, at present, matters are not at all advanced beyond what they were a twelvemonth ago. We do not mean to say that they are precisely *in statu quo*,—very far from it; because an entirely new face is now put upon them, the competition being now quashed altogether; and we are bound to suppose that so very invidious a step has not been resorted to lightly and incautiously. Be that, however, as it may, it can hardly fail to have a very prejudicial effect for the future, it being calculated to render architects more mistrustful than ever, and exceedingly shy of entering into competition under any circumstances, now they perceive that, even in a case of such great publicity, the committee and their advisers do not consider themselves bound either to adopt some one of the designs sent, or to afford the authors of the best of them the opportunity of revising and improving upon their first ideas; but at liberty to set every one of them aside, and to make application to other parties, who had not previously incurred any risk or expense, and who will now be able to profit both by the defects and the merits of the drawings they have seen.

Now we certainly do not mean to say that the committee were positively bound to adopt some one of the designs offered, even though there should not have been among them a single one worthy of being carried into execution. On the contrary, we are of opinion that to have done so would have been eminently reprehensible—nothing less than sacrificing the main object of all to punctilious delicacy, in defiance of prudence and common sense. Still, we cannot help likewise thinking that the plainest and most straightforward course would have been to allow those architects who had most distinguished themselves to compete again. That not being done, the only rational inference is, that, however superior their designs might be to the rest, they still fell so very far short of what was actually required as to be quite unsatisfactory even as testimonials of talent. Whether justly so distinguished or not, there were eight designs recommended by the umpires to the attention of the committee. Accordingly, when it was found that not one of the number could prudently be adopted, either on account of its expensiveness or for some other reason, the authors of those sets of drawings should have been allowed to compete again, each being furnished with a list of specific objections against his first design, which it would behove him to guard against in a fresh one. Nor can we help thinking that those architects have been rather wanting to themselves, in not uniting and petitioning the committee to that effect.

The indolence and apathy manifested by the profession itself are certainly not the least extraordinary part of the matter. Surely the Institute might very properly have taken cognizance of the case, it being one of considerable interest and importance; for, if the abuses of competition are not of sufficient importance to claim its attention, or it is unable to devise any check against them, we are puzzled to understand how it can at any time exert itself for the interests of the whole professional body. Nay, we should like to know what real good of any kind it has hitherto effected, or what steps have been taken by it to advance architectural knowledge and taste. Does it either contribute any thing itself towards such purpose? or does it promote the efforts directed by others to such end? However, such questions do not now concern us.

The non-interference, or rather the complete non-expression of opinion, observed by the Institute on one or two rather important occasions that have occurred since its first establishment, might be mistaken for perfect concurrence in the course respectively pursued, could we bring ourselves to believe that that body really approved of, as judicious, proceedings which caused no little dissatisfaction to some of its own members. Supposing, however, for a moment such to have been the case, and it was the dissatisfied public who were in error, surely it would not have been amiss, had the Institute opposed its voice to censures unmeritedly bestowed on parties who, in its opinion, had acquitted themselves, not only honourably, but ably. It is somewhat strange, on the other hand, that on no occasion of the kind, where perplexities and embarrassments have arisen, it should ever have been proposed, by way of *dernier resort*, to submit the case to the Institute as a competent tribunal, and one that would at all events vigilantly protect the interests of architecture, and strive to support its credit among us. In all cases of sufficient importance this might be done, let the competition itself take place in whatever part of the kingdom it may.

To these suggestions of ours it will be objected that the course recommended by them would not only require that committees should voluntarily give up their own authority, but that the Institute itself should consent to accept an office both arduous and delicate—not to say highly invidious. Difficulties, we confess, and those not a few would have to be surmounted, even if such arrangement were mutually agreed to. But what then?—they ought to be held as of no account in comparison with the advantages to be secured. Objections of that kind stand for nothing; because the question reduces itself simply to this: is such plan, or any other plan of the kind, likely to ensure what it has in view? and, if so, is it to be rejected for no better reason than that it would impose some trouble upon individuals, in order to promote a general cause? Should this latter question be answered in the affirmative, nothing more remains to be said. If, bad as the present system of competition is allowed to be, it is the best that is to be had, because the only practical one, whatever may be its defects, however blind, arbitrary, and capricious, it may be, it ought to be submitted to cheerfully, because voluntarily. If competition not only is, but must continue to be, a mere lottery, those who get blanks must resign themselves to their ill-luck with the best grace they can. We certainly do not see wherefore architects should expect any great sympathy from the public, so long as they themselves do not seem to have any sympathy for, or make common cause with, each other.

Carpe horam, would be our advice, because, should the opportunity now offered to the profession, by the singular delays, the various doings and again undoings, that have taken place in regard to the competition for the Royal Exchange, be suffered to pass away, it is not probable that a fitter and more important one will occur, unless it be, perhaps, that, after the lapse of a few more generations, reason and common-sense will be allowed to have a voice in such matters. In the Exchange competition, even the exhibition of the designs was little more than a nominal one. Besides the preposterously short time allowed for seeing them, the drawings themselves were hung up without regard either to numerical or any other sort of order; though, as it appears to us, both the most obvious and convenient mode of arranging them would have been into classes, according to their particular styles. Had, for instance, all those in which a Roman portico was made the chief external feature been hung up together, and the same with the rest, and a printed list of the numbers given to each visitor, instead of being bewildered, people would have been able to have compared those of the same class together. Again, instead of being hung up, all the plans ought to have been arranged upon tables, each opposite the set of drawings to which it belonged. Many plans, on the contrary, were hung up so high that any examination of them was perfectly out of the question. It is therefore impossible for us to say, especially so long afterwards, how far the result come to at present was borne out by actual circumstances. We must confess that, among all the designs, there was not one that completely satisfied us; but we also think there were many that might have been very greatly improved; and, if we mistake not, there were one or two which, though very mediocre as designs, were far better than the generality in their ground plans; and this leads us to observe, it is somewhat extraordinary that, in drawing up their report, the judges should not have stated which, among the eight designs recommended by them, was positively the best as to plan, whether so far in accordance with the given instructions, or not. Equally extraordinary is it to us that no kind of question whatever should have been proposed as to the propriety or impropriety of making the Exchange area a mere open court, so that only the sheltered ambulatory around it can be made use of in bad weather; whereas, by roofing it over, and lighting it by unglazed openings, forming a kind of clerestory above the side colonnades or arcades, as might be, not only would the entire space be equally available in all weathers,—consequently,

might, if found desirable, be somewhat reduced,—but this very circumstance itself might be made to lead here to some striking novelty of architectural character, because, though the place would cease to have the appearance of a court, it might still be made altogether distinct from that of a large hall of the same dimensions. There would be no windows, because no occasion for them; and, instead of there being any ceiling, the timbers of the roof might be rendered highly ornamental, according to the style of architecture adopted.

To make the Exchange merely an open court because it was so in the old building—is nothing else than to forego a very material improvement, when there is nothing to prevent its being carried into effect. Neither the Bourse at Paris,* nor that at Petersburg, is uncovered; and, in building markets, it seems now to be considered an improvement to have them protected from the "skiey influences;" yet, out of compliment, it is presumed, to the old structure, the new Exchange is to be, classically, *hypæthral*, and thereby exposed to all the humours and *humidities* of Jupiter Pluvialis in his fiercest moods! Another strange custom which is still to be kept up is that of having a parcel of petty shops in the building, as if the Exchange "of the first city of the world" was intended for the transactions of retail dealers! This will prove a most terrible surrender of dignity to necessity—if necessity it really be; therefore, it would be more advisable, especially as, in all probability, ample time for doing so will yet be afforded, to reconsider that part of the project, because it would be far better to give up a portion of the site to a separate range of buildings for shops, and to contract the other edifice accordingly, than to incorporate shops with the Exchange; because, besides proving quite prejudicial to architectural grandeur, shops are, of all places, those where fires are most liable to occur.

As to what will now, after all, be done, we must confess ourselves utterly at fault, and unable to form any conjecture; for so anomalous and eccentric have the proceedings been, up to this time, that we could just as easily calculate the return of a comet as guess what precise course matters will take. We have heard various rumours and *on dits*, all contradictory—none very probable. To us, the only tolerable certainty is, that whoever may be eventually chosen architect will have a very arduous task to perform, since, unless his design should prove greatly superior indeed to any of the rejected ones, it will have to encounter a great deal of cavilling from the disappointed competitors, whose criticism will not be very lenient. Yet, should a fresh set of perplexities occur, knitting the Gordian knot more closely than ever, we would advise the committee to cut it through at once; since, should the worst come to the worst, they can still build a new Exchange precisely on the model of—the *old one*.

CHIMNEYS AND CHIMNEY-POTS.

On the envelope of an article which appears in another part of this Journal, our intelligent correspondent has the following remark:—"Your observations on the public buildings of London are quite correct. However, there is one thing omitted, and that is, the total neglect of architects in the construction of chimneys and fire-places; for no where in England can you see so many ill-constructed pots and pipes as those which disgrace the tops of the buildings in London."

This is substantially true, and not more true than universal; and, London is the grand eye-sore in the matter of this abomination, merely because it contains more fire-places and chimneys than any other city or town in the empire. So very general are these unseemly appendages that one is tempted to believe that a modern room, with a fire-place to it, is constructed upon the same principle as a modern act of Parliament; that is to say, it will not work to the benefit of those for whose good it purports to be made, until it is amended, or, at all events, till a pot or pipe is put upon the top of the chimney, by way of a "rider on the bill." These things are, generally speaking, extremely ugly in themselves; they are highly dangerous to passengers, when the wind blows strongly and in gusts; and they are direct evidence of a total want of the first principles of architectural science on the part of those who plan and execute the buildings. The common ones, constructed of the materials of pan-tiles, are exceedingly ugly; and the pipes of zinc, tin-plate, or other metals, are not much better, whether they be vandyked at the top, as a sort of chevaux de frise against the sparrows, extended right and left, like hammer-headed sharks, or fitted with turning-caps surmounted by foxes, dragons, and other unseemly representations. The workers in Roman cement affect to make articles a little more handsome, and rows of them may be seen in the yards of dealers and builders. Now, these latter may be all very well in themselves, but they speak more strongly of the blundering abomination which they are meant to assist in correcting than even the tile-pots, the metallic pipes, and the turn-about monsters which shift with the wind. The language which they speak, and they speak it very plainly, is this:—"The planners and the builders of houses, though they can add brick to brick to any extent, are incapable of ascertaining beforehand whether any one apartment in the structure shall or shall not be so infested with smoke as not to be habitable." This applies to the common file of architects and builders, without, we may venture to say, a simple exception; and we regret to add that some men of considerable name are in equal ignorance in this respect: hence, some of the most costly mansions in the metropolis have the tops of their chimneys just as much disfigured by these unsightly things as the hovels in the meanest court or alley. There is one splendid exception, and that is Barry: his chimneys, both in their forms and dimensions, are harmonious parts of the edifice to which they belong; and, so far as experience has gone, not one of them requires a pot or pipe in order that it may perform its intended function. There are several other exceptions, but they are so few that we may lay it down as a maxim, that modern English architects, and builders generally, are acquainted with no principle whereby they can beforehand design a fireplace and chimney which, without any unnecessary or unwholesome current of air through the apartment, shall keep that apartment perfectly free from smoke in all states of the atmosphere.

In the olden times it was not so, for the chimney-pot is comparatively a modern invention, and it is an invention which is the obvious result of stern necessity—of the utter impossibility of inhabiting the rooms with any thing like comfort without this appendage; and even with it, there are very many rooms which do smoke, in certain states of the atmosphere and directions of the wind. Paris, we understand, is even worse than London in the matter of this nuisance,—not, perhaps, in the countless array of chimney-pots, but in the intolerable smokiness of rooms; and, in consequence of this, the Parisians dare not burn coal to any thing like the same extent it is burned in London, although it would be cheaper than wood, and the land upon which fire-wood is grown, if that could be dispensed with, might be turned to some better purpose. We have however, nothing to do with the chimneys of Paris, further than to hint that the

* The Halle aux Blee, a rotunda, whose internal diameter is 213 feet, with a centre area, covered by a dome, 137 feet in diameter, and surrounded by arcades, also deserves to be mentioned, because it seems excellently well contrived for an exchange; and it is rather surprising that no one should have taken an idea from it.

ignorance of modern architects and builders upon the subject of these is by no means confined to the British islands, but is as inveterate in other countries.

We have said that this nuisance of smoky rooms, and the unseemly attempt at the correction of it, are only of modern date; and we think that there is conclusive evidence of this, at least, in any building of the times of old which deserves the name of an architectural structure. In all ages, the huts of savages, and the hovels of demi-savages, have been, and continue to be, filled with smoke whenever a fire is kindled in them; but, amid all the memorials of antiquity, or of the middle ages, which are left standing, or dug out of the ruins, one no where meets with the slightest fragment of a chimney-pot; and there is no doubt that, had such things been necessary, that necessity would soon have called them into existence, inasmuch as the invention of a chimney-pot is not a matter which requires much science or taste. We must bear in mind however that, though in former times buildings were few, compared with what they are at present, they were always erected by the orders of influential parties, for their own accommodation; and those parties employed men of skill in the planning and constructing of them.

This leads us at once to the cause of the modern evil, more especially as it exists in towns, where it is more inveterate than any where else. The majority of town houses bear a wonderful resemblance to the Jew's razors mentioned by the satirist, which were "made to sell," and not to shave; for these houses are built to let, without the slightest regard as to whether the tenants can or cannot inhabit them comfortably. So habitually and so long has this been the case that, when an ordinary street architect is called upon to design, and a common street builder to erect, a superior mansion for a gentleman's own residence, they go about it in total ignorance of this most essential point; and, how gaudy soever the said mansion may be externally, and whatever may be the dimensions of its several apartments, there is no more security against smoke in every room, than if it were a den of costermongers, run up of the worst materials and at the lowest price. In making the external design, such parties take a scrap of one thing, and a scrap of another, until they make a precious piece of incongruity; but, when they come to the internal comfort of the apartments, which is really the grand point of the whole, they have got scraps of nothing to take, but must fall back on the blank of their own empty-mindedness. Therefore, the proper definition of one of their apartments is—a floor of a known size and shape, enclosed within walls of a known height, covered with a ceiling, pierced with so many holes for windows, and with an additional hole to hold the grate, and a tube leading from that hole to the top of a stack of chimneys; but, whether the smoke shall ascend this tube, or the wind descend it, or whether it shall be sometimes the one, and sometimes the other, must be just according as it turns out; for they—bless their wits, or the place where those wits should be—are in total ignorance of the matter.

We offer these few remarks in the hope that some of our correspondents, who have intimately studied the subject, may make our pages the means of promulgating a little information upon this subject, because they will thereby remove one of the greatest imperfections, not to say disgraces, of our common system and mode of building.

IMPROVEMENT OF THE MEDINA.

The improvement of this estuary, so as to render the town of Newport accessible at all times by steam-packets and other coasting craft drawing little water—to which we made a slight allusion in our preceding number, is, we understand, exciting a good deal of discussion, and provoking some opposition, especially on the part of the inhabitants of Cowes. There is no objection to the discussion of the question, to any reasonable extent; and public works are generally the better for a little opposition, inasmuch as that is the natural furnace in which they ought to be tried, and by which they may be better purified from the alloy of imperfections, intentional or otherwise, than they can be by any other means. But, if the improvement is to be what it ought to be, that is, the converting the whole estuary into a wet dock, by means of a substantial sea-wall, and a lock, or locks—one for smaller and one for larger craft, we think the opposition by the inhabitants of Cowes is not a suggestion of "absolute wisdom." The deepening of the upper part of the estuary, which in our opinion is the more expensive work, and a work which would never be at an end, is no doubt merely a question between Cowes and Newport, as to which shall be the great shipping place for passengers from and to Southampton. But the idea of the wet dock is a more general matter, and in some respects a national one; because, if the Medina were converted into a wet dock, that dock would be a most convenient place for building and repairs, and for the resort of shipping generally; and, instead of being in the slightest degree injurious to Cowes, it would unquestionably bring a large increase of all kinds of trade connected with shipping; and, though light craft might and would ascend the Medina, to Newport, Cowes would be the port for shipping of larger burden, and would acquire fame and wealth as an *entrepôt*, which it cannot be without some such accommodation as this magnificent wet dock would afford, and of which an exceedingly small fraction of the amount would cost far more money than the carrying of this scheme into complete execution.

There is one point connected with this case which is worthy of considerable attention, and that is the increase of the tail of the Mother bank opposite to East Cowes, in consequence of which that bank is advancing both upon the roads and the fairway to the pier at West Cowes. From the decomposition of the land at other parts of the adjacent coasts, and the peculiar set of the tides, this increase of the bank must go on; and, as the indraught of water into the Medina by the flood is stronger than the outfall by the ebb, the bank must gradually advance in the direction of the pier, so as in time to form a most inconvenient bar. Naturally, there are no very obvious means by which the formation of this bar can be resisted. If, however, the Medina were turned into a wet dock in the manner explained, and always kept at nearly the high-water level, it would put the parties in possession of very powerful means, and the only means so far as we know, of preserving the channel, and even increasing its depth of water. It will readily be understood that the estuary of the Medina, which is somewhere about a square mile of surface, and say even ten feet of an average depth of water over that surface, might be rendered one of the most efficient scouring basins any where to be met with; and, if its contents were let out from time to time, at low water, or at a considerable depth of the ebb, as circumstances might require, the bar, if it existed, would be cut asunder; and, if there was no bar, the formation of one would be completely prevented. We do not suppose that this would require to be done very often; but, then, the doing it would be only the loss of water for half a tide; and, although the craft in the wet dock or basin should ground during the time, the bottom is of such a nature that they could not receive the smallest possible injury. This consideration alone makes strongly in favour of the improvement; and when we take it in connection with the others, the effect of the whole is irresistible.

There is another commendable circumstance connected with this project, namely, that it is not intended to be carried into execution by a company for their private benefit, but by commissioners for the general benefit of all parties concerned; and, thus, it has a chance of being much more skilfully and cheaply done than joint-stock undertakings, at the same time that it has none of their tendency to degenerate into a job.

BRISTOL DOCKS.

18, Duke-street, 26th December, 1839.

GENTLEMEN,—In compliance with your request, I have prepared estimates, as accurate as the nature of the circumstances, and the information which I have before me, has enabled me to do, of various works proposed for the improvement of the Port of Bristol. These estimates may, I believe, be relied upon as ample, and will serve every purpose of enabling you to determine which of the various alternatives here presented are most desirable, or how much may be within the limits of the means which may be devoted to these purposes; but they may be subject to material modifications hereafter, when I shall have had the means and the time for obtaining more detailed information, and more correct data, by making borings, and otherwise examining the sites, and preparing the detailed drawings and specifications of those particular works which may be determined upon, and particularly when the mode and the time which can be allowed for carrying on some of the works shall have been fixed. In the proposed improvements of the river, for instance, if they are to be effected gradually, and by parties now engaged in working the quarries along the river, they may be executed at a less sum than I have estimated; but, on the contrary, if they are to be undertaken all at once, and prosecuted vigorously, and without consideration of the opportunities of getting rid of the stone and materials obtained, the expense will exceed what I have stated.

The principal works which are comprehended in these estimates may be classed under four different heads, namely:—

First,—The improvement of the river, by cutting off some of the most objectionable points, and thereby straightening and widening the channel.

Secondly,—The improvement of the entrance into Cumberland Basin and the Float, by constructing locks which will admit of the largest class of coasting and channel steam-boats, and will at the same time be available for the general trade.

Thirdly,—Floating accommodation for steam-boats of the largest class for the American and other distant service, either by admitting them into the Float by a lock of sufficient dimensions, or by constructing docks at some distance down the river, communicating at once with the Float.

Fourthly,—Accommodation by a pier, at the mouth of the river, for steam-boats of all classes, and at all times of tide and weather.

These different works must, however, be considered in conjunction with each other; as the execution of the whole would be unnecessary, while the advantages of each, and even the extent to which they ought to be carried, will depend upon the adoption or rejection of the others.

The 60 feet locks at Cumberland Basin, and thence into the Float, are perhaps the only works the expediency of which can at all be separately considered:—the estimated cost of both locks, including some contingent works, would be about 82,000*l.* The accommodation for the larger steam-boats may be obtained in three different ways, and in various degrees; and upon the nature, as well as the degree, of this accommodation, will mainly depend the extent of the works required for the improvement of the river, as well as the necessity and extent of the accommodation to be provided by the pier in the Severn.

The first mode which naturally suggests itself is the construction of a lock of sufficient dimensions to admit these vessels into the Float. This involves the most extensive scale of improvements in the river, and perhaps it may still be questionable whether the great width of this class of vessels would not be the cause of serious inconvenience to the general trade, if they were to be brought up the river frequently, and upon the neap as well as the spring tides; the total expense of this entrance, and the necessary improvements in the river, would, by the accompanying estimate, be 92,400*l.*

The second mode is by the construction of distinct docks at some distance down the river, and below which point the channel would be wider and deeper, so that every accommodation could be afforded without any interference with the other shipping. The cost of these docks would vary, according to the extent determined upon, from 80,000*l.* to 120,000*l.*, while the works still required for the general improvement of the channel above these docks might probably amount to about 12,500*l.* The expense, therefore, of the smaller dock would be about equal to that of the entrance into the Float, with the more extensive works in the river.

The third mode is the giving very perfect accommodation at the proposed pier, so as to render it unnecessary to take the large steam-boats up the river, unless for purposes of repair, which may require them to be docked: in which case, if brought into the Float, the paddles may be removed, and, by some modification of the arrangements of the gates and bridges at Cumberland Basin, they may be passed through these locks. The expense, in this last case, of the pier and the improvements of the river, would be about 70,500*l.*

I have not, in any of these estimates, included the cost of land, as I have not obtained any valuation of the property; but in other respects I have estimated rather in excess, and have assumed the best materials and the most perfect construction, such as I should recommend to be adopted; still some reduction might be effected by substituting Hanham stone for the granite quoins and coping, and in some other points of detail.

I am, Gentlemen, your obedient servant,

To the Committee, &c. &c. J. K. BRUNEL.

Estimate of the several under-mentioned works in each case, exclusive of the purchase of property.

PORTISHEAD PIER.

A pier of 600 feet in length, with storehouses, passenger-sheds, &c. &c., communication with the shore, wharfs, and improvements of the roads leading from Bristol....	£45,000
The same, with a pier 900 feet in length, and proportionate accommodation, affording berths alongside, and within shelter, for one first-class steam-boat, and two or three of the class of the Irish traders, at the same time, and shelter for as many others	£58,000

IMPROVEMENT OF THE RIVER.

Removing projections at the Hotwell House, and restoring the wall and straitening the road.....	£1,300
Removing entirely Round Point, diverting turnpike-road, and forming new towing path, &c.	£5,850
Removing only that part of the rock now projecting beyond the towing path, or so much as can be removed without diverting the turnpike-road	£1,200

Reducing the projection on the south side under Leigh Wood, below Round Point	£4,750
Widening the river opposite the Black Rock quarries	£2,000
If the bend be straightened, in addition to the above	£2,500
Removal of several small impediments	£2,000

NEW LOCKS, ETC.

Constructing an entirely new south entrance lock, 60 feet wide and 220 feet long, with granite hollow quoins, sills, and copings; with the alteration of the north quay wall, and the extension of the new south quay wall to the point from which the proposed steam-boat wharf is to be formed	£42,000
New lock of the same dimensions as the above, from Cumberland Basin into the Float	£40,000
Steam-boat wharf, capable of giving berths and landing places to five small steam-boats	£7,500
Construction of a new large steam-boat entrance into the Float, 85 feet wide and 350 feet long in the chamber, with sea gates, &c. &c., and removing the present obstructions in the river which exist above Cumberland Basin entrance	£74,000

NEW DOCKS.

Sea Mill docks, with eight acres of dock-room, affording berths for seven steam-boats of the largest class, and floating room for two more, lock entrance of the same dimensions as the last named, with dock-house and such sheds as would be absolutely necessary for the landing of passengers and goods from one vessel alongside, with reservoir for back water	£120,000
A dock at the same situation, of about five acres, with berths for three vessels of the largest class, and floating room for two others, capable of being increased afterwards, with lock chamber, as above	£98,000
Or with a single pair of gates and no lock chamber	£80,000
The same outlay in the situation of the upper dock would give increased accommodation to the extent of one berth alongside and one afloat, with greater facilities for extending or improving, and an easier entrance.	

18, Duke Street, Westminster, Dec. 26, 1839.

Gentlemen,—Having prepared the estimates required by your resolution of the 13th instant, accompanied by a short explanation of the nature and objects of the different works included in them, I have thought it my duty also to put together in the shape of a report, as the result of my recent observations and the surveys now just completed, the opinions which my former acquaintance with the Port, assisted by these late investigations, have led me to form as to the principal improvements, which (it appears to me) are absolutely necessary to be made for the preservation and extension of the trade of the Port of Bristol, and as to the best and easiest mode of effecting these improvements, and the works which must be executed for that purpose.

It is admitted on all hands, and it does not require that I should now attempt to prove it, that great increase of accommodation, as well as other inducements, are necessary to secure such increase of trade to the Port of Bristol as shall enable it even to maintain the same relative position with the other ports of England which it now does, and which, practically, is only standing still, but much more are they required if any advance is to be made.

If the number of vessels of the same class as those at present frequenting the Port is to increase, the arrangements at the entrance of the docks must be improved; the natural impediments in the river, arising from its circuitous course and contracted channel at several points, must be removed, so far as it is practicable, and those artificial obstructions which have been allowed to be formed by encroachments into the channel must be swept away. If the new trade which has for the last few years been so rapidly increasing, and which is already so extensive that the loss of it would be ruinous to the port—the steam-boat trade—if this is to be encouraged, not only are the improvements already mentioned doubly necessary, but further accommodation to suit the peculiar demands of this class of vessels must be afforded.

The great dimensions of these vessels require corresponding dimensions in the locks for their entrance into the Float, or some other arrangement by which they can be accommodated; and the system of steam-boat service, involving, as a condition, the greatest possible regularity and certainty of arrival and departure, requires to be perfect the means of landing and embarking, at least, the passengers and mails, at all times of tide and during all weathers. Such a landing place must therefore be constructed at some point in the Severn, and where there is shelter and depth of water at all times. It appears, therefore, that, for the present trade of Bristol, and to meet that gradual increase which is equivalent only to being stationary, relatively to the generality of other ports, and those the least improving ones, it is become not merely desirable, but essential, that the means of receiving a number of vessels upon the same tide should be increased; that the channel of the river should be improved, so that not only a larger number, but a larger class, of vessels may be safely navigated; and, lastly, that some arrangements should be made for the larger class of steam-ships recently introduced, and in which introduction Bristol has so successfully led the way, and maintained so decided a superiority, by which arrangement these vessels may be enabled to frequent the Port of Bristol.

Amongst the several works included in the estimates laid before you are various modes of effecting these requirements. It fortunately happens that the least expensive combination of these different works affords by far the greatest *proportionate* amount of accommodation, and is the best calculated to meet the *immediate* wants of the Port, and the most susceptible of future improvement and extension.

The improvements proposed at the entrance into Cumberland Basin, and thence into the Float, consist principally of the construction of a new lock in each case, not merely for the purpose of passing more freely than at present the trade generally, which is now limited almost entirely to the use of one lock, but also, by their increased dimensions, of admitting the class of steam-boats used for the Irish and coasting carrying trade. At present, few vessels of this class, unless built expressly for Bristol, can enter the docks, the dimensions of the locks being much below those which have very generally been adopted by other traders. If, therefore, notwithstanding the species of monopoly caused by this accidental circumstance, so large a trade has been created (and which is highly creditable to those who have profited by without abusing the advantage of this partial monopoly,) how much more may be expected when the trade is thrown open, and when the means of first landing their passengers at any time of tide, and then entering the docks for their cargo, is afforded to vessels of all sizes likely to be employed in this trade.

[Conclusion of this article in our next.]

REVIEWS.

A GLOSSARY OF TERMS USED IN GRECIAN, ROMAN, ITALIAN, AND GOTHIC ARCHITECTURE.

The Third Edition, enlarged, exemplified by Seven Hundred Wood Cuts. Two vols. 8vo, one of Text, and one of Plates. Oxford, 1840.

WIDELY different is this "Glossary," as it is modestly entitled, from Britton's Dictionary of Architecture, which, notwithstanding all the puffs bestowed upon it by critics whose good nature outweighed their honesty, is now generally known to be a shallow performance. We do not say that it absolutely contains no information, but what it does is borrowed from preceding works, some of which, by the by, are spoken of very slightingly in the preface, and is so mixed up with egregious blunders, and with absurd and irrelevant matter, that those who place implicit confidence in it, or are unable to separate the sense from the nonsense it contains, are in danger of being led into very serious, yet at the same time very ludicrous, errors.

The very reverse of that boastful production, this anonymous Glossary, though both less bulky and less expensive, is not only positively very much superior, as affording far more real information, but negatively also, as being free from all the defects which stamp the other performance. It will be found to contain a greater number of really serviceable terms, far more intelligently explained, without those useless, obsolete, and irrelevant ones with which Mr. Britton thought proper to cram his book, at the same time that he omitted a very great many that certainly ought to have found a place in it,—passing over, for instance, "Arcs-doubleaux," "Cushion capital," "Fan-tracery," "Hypæthral," and numerous terms of that description, while *knife!* is introduced. Surely after that the knife of criticism may be freely employed in cutting up John Britton, F.S.A. Indeed it is difficult to guess what class of readers that learned gentleman could possibly have in view when he deemed it necessary and expedient to explain for their use words which, so far from being technical or antiquarian, are understood by every one: for instance, "Avenue," "Cottage," "Edifice," "Fabric," "Hermitage," "Shambles," "Tenement," &c., which form so very singular a contrast to numerous others that are not likely to occur in any person's reading, except those who are greatly advanced beyond Mr. B. himself; consequently, well able to dispense with his assistance. Thus, between these two very opposite classes of unnecessary words, his Dictionary becomes reduced in substance to very much less than its actual bulk promises. All that is really useful in it, might have been comprised within half the number of pages. It betrays, indeed, evidently enough, that the chief object was to give as much as possible in point of quantity, without any regard to quality, and to conceal its real meagreness and defectiveness, by pouring in indiscriminately whatever offered itself. The book may fairly be said to be *padded-out*, and that, too, in a very bungling manner. And yet, strange to say, notwithstanding the utter want of both ordinary judgment and ordinary care and diligence which the work displays, it has obtained the good word of some critics, who, however, discreetly forbore from entering into any examination of its contents, trusting that their readers would take their word for its excellence; and, if readers afterwards discovered it by no means answered the character given of it, why so much the worse for them; but at all events one purpose had been answered, namely, selling the book. Hardly will any one say that, in speaking of that performance, we step out of our proper course, it being impossible otherwise than by comparison to point out wherein one work of this kind surpasses another, their purposes being similar, and their matter for the most part the same, so that the superiority or the contrary must arise chiefly from the judgment and care, or else the opposite qualities, displayed in the execution. How should our readers understand that this "Glossary" is decidedly, or even at all, better than the other publication, if we merely noticed it without reference to the latter? On the contrary, might not some of those who, upon making trial of it, have found out how greatly the Dictionary falls short of the character given it by *good-natured* reviewers, very reasonably question, in that case, whether the present work is in any respect better, if even so good. Or if it be said that we might produce specimens, and let them certify the value of the book, we reply that one of this description is not to be tested after that manner, by a few detached and individual articles selected from it, but by its average merits and the general usefulness of its plan. To judge of this latter it becomes necessary to know not only what has been done, but what has *not* been done—what has been avoided as well as what has been adopted.

It is not the least merit of the Glossary that it is free from both classes of useless words, so incongruously admitted into the Dictionary,—from such as almost every child understands, and from such as are now utterly obsolete, including several towards whose meaning not even a guess is afforded, among notable instances of which may be mentioned "*Pyking* the bells;" yet are we consoled in all such cases by knowing that we lose nothing by being left in ignorance. To pass, however, from negative merits of omission to positive ones of execution, we find that, in its present enlarged and greatly improved shape, the "Glossary" now gives us the foreign synonymes for the principal architectural terms in French, Italian, and German; and, if the idea itself has been suggested by the other work, it has been here carried out far more consistently, uniformly, and sensibly. To say nothing of the exceedingly numerous and shamefully stupid blunders with respect to foreign words in the Dictionary, that part of its plan was at the best but very imperfectly adhered to, the foreign words being sometimes given in five or six different languages, at others only in one, and in the latter half of the alphabet scarcely any are given at all. Besides which, the strictly technical terms, those most wanted, because not always to be met with in general dictionaries, are precisely those which are not supplied from other languages. Thus, though we find the foreign words for Angel, Architect, Column, Pillar, Roof, Room, Window, and others of that description, which are in ordinary use, we do not obtain those which belong more peculiarly to the terminology of architecture, such as those corresponding with Elevation, Plan, Gable, Pediment, Impost, Spandrel, and nearly all others of the same class.

Though still capable of improvement in regard to foreign terms, the Glossary is in that respect immeasurably superior to the Dictionary; in fact the very first term, "Abacus," corrects one of Mr. Britton's ridiculous mistakes, *Platte*, not *Rechentisch*, being given as the German word. Were we to go on comparing them, we should make out a pretty long list of discrepancies, not very much to the advantage of the Dictionary and its learned author. Besides, too, being so very much superior in point of correctness and completeness, the Glossary is more serviceable, because the foreign terms, being repeated in their alphabetical order, can be referred to for their English meanings.

In other respects, likewise, the Glossary performs much more than it professes to do, or than we have reason to expect from a work so denominated, as it contains much more than explanations of words. The articles Mouldings, Mullions, Transition Style, Domes-

tic Architecture, Early English, Saxon, &c., are much more full and satisfactory than those in the other work, notwithstanding that we should naturally expect to find the subjects they treat of there noticed at greater length. Annexed to the article Window is another, of some length, on Stained Glass (contributed by Mr. Williment); and, besides other matter, the appendix contains two on Sepulchral Brasses and Encaustic Tiles, by Albert Way, Esq. Among the terms, some of those introduced by Mr. Willis have been adopted, and in our opinion they should all have been noticed, if only for the purpose of pointing out what explanatory terms are still required in architectural description, in order to avoid ambiguity on the one hand, or awkward and tedious circumlocution on the other. It is owing, no doubt, to the want of terms for such purpose that, in speaking of windows or other arched apertures in Gothic architecture, no attempt is made to define the proportions or other particulars of the whole, but merely those of the arch itself; yet two openings of the kind that may so far perfectly agree with each other may be of different character in regard to many circumstances which are not taken into account. Mr. Willis has suggested several apt and convenient terms for the terminology of Gothic architecture, and Mr. Hosking has also contributed a few to that of Grecian: nor do we see wherefore the example they have set should not be followed up. At all events it appears to us that to invent new terms which are really wanted would be a far more meritorious task than that of ferreting out obsolete ones which are of no use whatever when brought to light,—at least not to the architectural student, however deserving of notice they may be as mere philological curiosities. A few terms of the latter description have indeed been admitted into the Glossary; but the other work absolutely makes a most extravagantly ridiculous parade with them:—Alcha, Baugium, Bodium, Boziga, Funticus, and other choice dog's-latin words are there carefully treasured up, and certainly serve well enough to make a tawdry show of learning.

As in every other respect, so also with regard to the manner in which it is illustrated, the Glossary is by far the more cleverly planned and executed work. The numerous wood-cuts introduced in the text serve as lucid graphic definitions, not only conveying an accurate idea of the forms and members described, but impressing them upon the memory; to say nothing of the very great attractiveness which the volume itself derives from them. The plates, forming the other volume, afford additional examples, which, though chiefly, do not consist exclusively, of features and details belonging to Gothic architecture. They embrace, besides, a much wider range of subjects than do those of Britton's Dictionary; for while the latter are confined to the leading parts of ecclesiastical architecture, the others furnish some examples of ornamental parts belonging to domestic buildings; also of gables, panels, porches, pulpits, screens, and of windows in very great variety. In short, we are of opinion that, as it is now extended and illustrated, this Glossary is likely to become very popular, and to prove eminently serviceable, being exactly the kind of book, so long wanted, and calculated to inspire a taste for the study, and to lead readers on to works of higher pretension. We do not say that it is incapable of improvement in another edition; we would not recommend much further enlargement.

THE PICTURESQUE ARCHITECTURE OF PARIS, GHENT, ANTWERP, ROUEN, ETC.

Twenty-nine Drawings from Nature, by Thomas Shotter Boys, and Printed entirely in Colours, by C. Hullmandel.

We cannot help being of opinion that this work has been overpraised, and that somewhat more temperate commendation would have been more discreet; our own expectations had been wound up to so high a pitch by the flaming eulogiums upon it we had met with, before we had an opportunity of judging with our own eyes, that, when we did see it, we felt considerably disappointed. The language seems to have been ransacked for the most magnificent epithets and hyperboles, in order to express the wondering admiration of reviewers in perfect ecstacies, who had discovered what, *mutatis mutandis*, the following couplet of Byron's might be applied to:

> "In virtues nothing earthly could surpass her,
> Save thine, incomparable oil, Macassar."

We do not say that these specimens of Lithochromy are just another "mare's-nest," as the Daguerrotype is now likely to prove;—and, by the by, what is become of that most astounding invention, which was to have been the death-warrant to all architectural draftsmen? But we really do not perceive the extraordinary merit claimed for them, otherwise than that they show what may now be accomplished in lithography, and the great improvements which have taken place in its mechanical processes.

Judging by what we here behold, we should say that Lithochromy, or Chroma-lithography, is very well adapted for producing facsimiles of an artist's coloured sketches, for which nothing more than broad indications and general masses of colour, are required; but that more than this is hardly to be anticipated. If it be capable of achieving more—which from the tediousness of the process, and the delicate carefulness it requires even now, we are disposed to question—more has certainly not been accomplished in these views, since they exhibit a very limited palette; and, wherever positive colours are introduced, the effect is apt to be somewhat hard and crude. We are therefore of opinion that it will be found chiefly adapted for architectural subjects where little variety of tints and hues called for.

Proceeding now to consider the volume as regards the subjects and not the execution of the plates, we cannot help expressing it as our opinion that a more careful selection of the former would have rendered the publication of far higher intrinsic interest, and would have stamped it with a value that would outlast its attraction as a mere novelty, destined to give place to some fresher Cynthia of the hour. His choice of subjects would lead us to suppose that Mr. Boys has far greater relish for the picturesque than for architecture itself, the latter being, in many instances, treated as of secondary importance to the other; and, in one or two, the buildings which are professed to be represented are all but screened out from view by houses, whose grotesqueness alone recommends them for the pencil. Whether such be really the case or not, the artist seems not to have wasted any of his time in looking about for virgin or unedited specimens of mediæval architecture. The consequence is, that we here meet with several old friends, not, indeed, with new faces, but with the same familiar ones they have worn in other publications. The view of the Hotel de Clugny, for instance, is almost identical with that given in Pugin's Paris; and the "Horloge," at Rouen, which, Mr. Boys himself says, "may be called the Temple Bar" of that city, was already nearly as familiar to our eyes as the one in Fleet-street. Neither is the portal of Chartres Cathedral shown very differently from what it had previously been by other artists; we mean the view itself is a repetition, instead of being made a fresh picture. The Hotel de Ville at Arras is not quite so hackneyed a subject as those we have mentioned, but its architecture is far more singular than pleasing, while, as here represented, it has too much the look of a ghost of a building, or like one cut out of

pasteboard. We greatly prefer to it the small architectural bit in the renaissance style, which extends obliquely from the Hotel itself, on the left side.

It would seem that, in some instances, the drawings have not been reversed on the stone, in consequence of which, they are reversed in the impressions: at least we do not understand how, in the view of Laon cathedral, if we are looking at the *north* transept, we can see the west towers to the left of it:—perhaps it should have been called the *south* transept in the description.

Having mentioned the descriptive letter-press, we ought to say that it consists of only two leaves, which are not bound up with the volume, in order to evade the claim of the copies to which the British Museum and some other public libraries would otherwise be entitled. Yet we cannot help considering that, ingenious as it is, the stratagem so resorted to is still more paltry than the enactment itself can be considered harsh or illiberal. To affect to consider the latter a tax upon publishers or authors is most absurd—a fallacy that can impose only upon those who imagine that each copy of a book is produced individually, and that for every copy so required the publisher or author must go to market and pay hard cash for them, instead of merely giving them out from his warehouse. In fact, the copies so claimed are only one of the items of publishing expenses, and the tax is in reality paid by the public;—that is if the whole impression should be sold, and, if not, nothing is saved but a few more copies in the stock of waste paper. That the outcry against this pretended hardship is as impudent as it is preposterous becomes apparent when it is known that publishers frequently give away, without grumbling, more than ten times the number of copies claimed by public libraries; and we may venture to say they would, at any time, freely give away more than double as many, could they thereby ensure a sale that would produce a handsome profit. In short, it is all stuff to talk of the claims alluded to as operating as a tax upon literature.

But we have been playing the truant with our pen, and will, therefore, now return to Mr. Boys and his book—we were going to say, but correct ourselves by calling it a series of plates,—remarking that the course adopted by him, and likewise by others in similar works, has no other effect than that of depriving such publications of the interest which might else be imparted to them, and excluding from them the information they might be made to furnish. The consequence is that, after a volume of this kind has been turned over for a few days on a drawing-room table, till it has become nearly a bore, it is quietly banished to the library, and seldom referred to afterwards.

Ours is undoubtedly a far more sober view of Mr. Boys' performance than others have taken, yet, should it have the effect of moderating people's expectations of it, and cause them to be agreeably surprised at finding it surpass the character we have given of it, he will have no great reason to be displeased at anything we have said.

The circumstances connected with the building of the Royal Exchange are not known to the public. All the money the Committee have to build a Royal Exchange with is something short of 50,000*l.*, received from the Royal Exchange Fire Office. The remainder, amounting to 100,000*l.*, is to be advanced by the Corporation and the Mercers' Company, out of their own funds. The merchants, for whose special advantage and accommodation the building is to be erected, are not advancing one farthing towards the work, although it was stated at the outset that they would dip their hands into their pockets to the tune of 100,000*l.* or 200,000*l.*, without hesitation, for the purpose of raising an edifice creditable to the character of so affluent a civic community.

CAPTAIN BASIL HALL ON BEACON LIGHTS.

At the meeting of the Institution of Civil Engineers, on the 7th of February, this intelligent and enterprising officer made some very appropriate remarks on the relative advantages of fixed and revolving lights, in which he showed the general advantage of the latter, at least when the evolution is of a peculiar kind. In the case of a fixed light, whether concentrated by a reflector or a lens, the light throws a narrow beam in one direction only; and, if a vessel is at a considerable distance, or if there is a haze in the atmosphere, though not amounting to one of those dense fogs which are impenetrable to any distance by all lights, the vessel may pass so soon out of the direction of the beam so that none on board may see it. If, however, the lens is made to revolve, so that it traverses on a surface resembling that of a flattened cone, the beam of light from it will be thrown round the circumference of a circle, larger in diameter in proportion as the plane of the revolving lens is more oblique to the base of the cone. By this means there are always two chances of finding the light; and not only this, but the atmospherical refraction converts the circle round which the axis of the lens travels into a disc of continuous light—not quite so bright as the single beam when the lens is immoveable; but not so much diminished as one might suppose, and extended over a much wider range, by which means it is much more easily found. As this subject is one of the greatest importance, both for the lives of men and the safety of property, Captain Hall's remarks excited much interest in the members present, and this interest was increased by his announcing some experiments, in illustration of the subject, to be made at the tower on the ensuing Friday, and to which he invited such of the members as could attend.

The experiments were made accordingly, and the light employed was that of a common argand burner, at the distance of about 1,000 feet; the light being concentrated by a lens, in the axis of which the observer was of course placed. The intensity was ascertained by means of pieces of coloured glass, which were added one by one, until the light seen through them was barely visible as a small nebula amid the darkness of the rest. In the case of the revolving lens, the point of observation was the axis of the cone upon which the lens revolved; and, though some of the experiments, or at least the same experiment seen by some of the observers, varied as to the diminution of intensity, occasioned by the revolving and consequent increased breadth of light, yet the average was only one-tenth; the fixed light being seen through ten pieces of coloured glass and the revolving light through nine of the same. The revolution was effected by eight lenses placed in a frame, turning round on its centre at the rate of forty-two revolutions in a minute, which gave a perfectly stationary light, though flickering and unsteady in its intensity. From this it will be perceived that Captain Hall's revolving light is really a stationary one, in the aggregate of the lenses, though individually these lenses have a pretty rapid circular motion. Therefore it must not be confounded with what is usually termed a revolving light, which means a light that revolves in its whole mass, in some plane, and generally speaking in the horizontal one. The use of this kind of revolving light is the distinguishing of one lighthouse from another; whereas the use of Captain Hall's revolving light is to render any beacon light more easily seen by the mariner, whether that light be in itself stationary or revolving; and, as it applies equally well to every single light, it is just as well adapted for lighthouses which show several revolving lights in succession as for those which show only a single stationary one.

After his experiments the captain made some very judicious remarks on lighthouses generally, and strongly recommended the lenses of Fresnel, which are built in segments, and admit of being made much larger, and by this means refract and turn to useful account no small portion of light which is lost by an ordinary lens. As an actual proof of this, he instanced the lighthouse erected by Mr. Stevenson at the Isle of May, in the entrance to the Frith of Forth, which is furnished with Fresnel's lenses, and is, in respect of brilliancy, the best lighthouse in the kingdom. Captain Hall's experiments excited much attention among the profession,—a large number of engineers and other scientific gentlemen who were present expressing themselves strongly in favour of the plan.

The same topic was again resumed, in a desultory conversation, at the meeting of the institution on the 18th of February, upon which occasion there was a very full attendance. Many gentlemen made remarks upon what had been stated and illustrated by Captain Hall; and all seemed to agree in regarding his plan as one calculated to be of great service. In the course of these remarks, however, a hint was thrown out that the grand desideratum in lighthouses still remains to be supplied,—namely, the obtaining of so intense a light as shall penetrate those close fogs which are at times so especially dangerous upon various parts of the coast, and more especially in the estuaries of the larger rivers, where the greater heat of the brackish water, than of either the salt or the fresh, produces something analogous to the London fog, though, of course, without the substances which that fog derives from the smoke. In the case of shore fogs, which form on the land, there is always more density upon the heights near the sea than upon the slopes and beaches lower down; and, in consequence of this a lighthouse placed on or near the beach is of great service; when the light of one situated on the heights immediately inland of that beach is quite obscured, and consequently of no use whatsoever. There is a practical example of this at the back of the Isle of Wight. A lighthouse was erected on the top of St. Catherine's, the highest ground in the island; but this has long been abandoned as useless; and a more serviceable one is now nearly completed close by the beach of the Under-cliff near Puckaster cove;—a much more judicious situation, and one in which the lighthouse cannot fail in being of great service to vessels sailing near a coast beset with so many perils.

THE ROYAL EXCHANGE.

We shall briefly state the circumstances which have occurred during the month relative to this matter. Mr. Smith, the City Surveyor, who was appointed to inquire into the eligibility of some one of the designs selected by the umpires for the premiums, submitted his report to the committee, in which he advised the rejection of the whole of the designs. The committee, acting on his advice, without ceremony, threw the supposed successful candidates overboard, and boldly selected six other architects, whom they requested to send in designs for the contemplated building. The gentlemen so honoured by the committee were Sir R. Smirke, Mr. Barry, Mr. Gwilt, Mr. Hardwicke, Mr. Cockerill, and Mr. Tite, the whole of whom, excepting the two last, declined accepting the invitation, being doubtlessly influenced to such course by the bad faith observed to all parties by the committee. Here the matter rests at present.

The committee, we are informed, are in a sad dilemma, never contemplating that four out of the six chosen would have resigned. The matter is even worse than that, for Mr. Cockerill and Mr. Tite, from previous connection, considered as one party, are not competitors.

On the 13th of February, a court of Common Council was held, at which a petition was presented from Mr. Mocatta, one of the architects who had sent in designs to the Royal Exchange committee, praying to be allowed to prove before the committee that his plan was practicable, in opposition to the opinion expressed by the gentlemen to whom all the designs were submitted.

Mr. Mocatta called upon the court to permit him, in fairness, to show the practibility of his plan, by evidence which he was prepared to call before the committee.

Mr. Heppel was in favour of the petition. The petitioner had declared that he could execute the building for the sum of 285*l.* more than the 150,000*l.*, to which, by the direction of the committee, the expenses were to be limited, and he was persuaded that a grand work would not be impeded on account of such a trifle. The petitioner was most anxious to be heard by himself and witnesses before a tribunal of men of experience and scientific skill. The circumstances in which the committee was placed were rather singular. After it had been decided that some of the designs which had been submitted to them should be selected, they determined that five architects should be invited to send in new designs, and Mr. Cockerill, who had been one of the original candidates, was added to the list. Four out of the five had declined to send in designs, so that the competition lay entirely between Mr. Cockerill and Mr. Tite. Mr. Cockerill's estimate was, it appeared, greatly above the 150,000*l.*; and, as for Mr. Tite, there seemed to be no work of that gentleman which justified the selection of him at the 11th hour. (Hear, hear.) Mr. Heppel moved that the petition should be referred to the Royal Exchange committee.

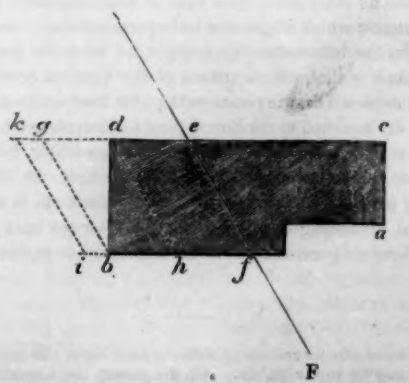
Mr. Musgrove seconded the motion.

After some discussion, Mr. Anderton said that the court was not in a situation to comply with the petition, and moved that it should be laid upon the table. (Hear.)

The amendment being seconded, the court divided, when there appeared, for the amendment, 48; against it, 34; majority against the petition, 14.

ASCERTAINING THE DIAGONAL DISTANCE THROUGH A BUILDING.

Sir,—I beg to communicate a method I have practised for finding the length of the axis of a railroad, or of any line intersecting a building diagonally, in the hope that it may perhaps be found useful, and considerably lessen the labour of engineers and surveyors, when a similar operation is to be performed.



Let F E be the required length of the line intersecting the building *a b d c*. The points *f e* being given, take the lesser distance, *e d*, and set it off from *f* towards *b*, which will give the point *h*. Now, by construction, *h d* is equal to *f e*, and *h b d* is a rectangular triangle, supposing the building to be rectangular. By adding the squares of *h b* and *b d* together, and extracting the square root of their sum, the length of *h d* is obtained, equal to the required line *f e*.

This rule is evidently simpler and shorter than the tedious process usually resorted to, and, when employed myself on the Belgian line of Sambre and Meuse, I frequently met with detached houses in the open field, through which the line must unavoidably pass, and, till I discovered the above rule, spent a great deal of unnecessary time in operations of this description.

There is but one objection to the adoption of this plan—which is after all but an application of the square of the hypothenuse—which is when the building is not rectangular on either side; but the surveyor rarely meets with detached houses which are not rectangular on one side, and one right angle of 90 degrees is evidently sufficient for the operation. I am, &c. A. D. C.

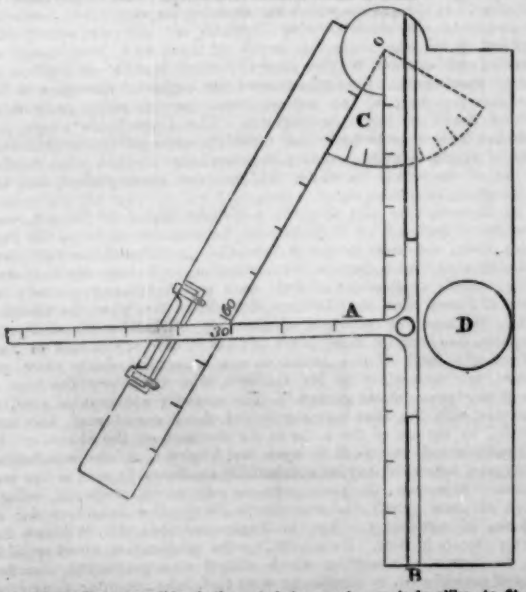
Claremont Square, Feb. 5. 1840.

NOTE BY A SURVEYOR.—The only objection to this plan is, that the same results may be obtained by simple measurement, without calculation of any kind, thus:—take the distance of the longest side *f b*, and set it off from *e* to *g*; it is evident that the line *b g* will be parallel to *f e*, and cut by the same parallels,—the sides of the building produced; consequently the line *b g*, which can be measured, will be equal to the length of the required line *f e*. If a distance *f i* be taken, and set off on the shorter side *e k*, the distance *i k* will not be affected, if the building be out of square, provided the sides *b* and *d* are parallel.

BASE AND PERPENDICULAR INSTRUMENT FOR SURVEYING.

THE instrument invented by me, and represented in the accompanying diagram, is made similar to a six-inch rule, with a single joint.

VIEW OF THE INSTRUMENT WHEN IN USE.



A is a brass T square slide, both parts being made precisely alike, to fit the groove B in the rule, so that, when the instrument is not in use, the blade of the T square will fill up the whole length of the groove; and the short side match the end. It may be then carried in the pocket without injury.

C is a quadrant, attached to the joint of the rule, divided into 90 degrees.

D, a small compass.

The blade of the T square A is extended to 100, and is graduated into tenths, the same as the two blades of the rule. A small spirit level is fixed flush in the blade of the rule, which is of service in determining the dip of any strata.

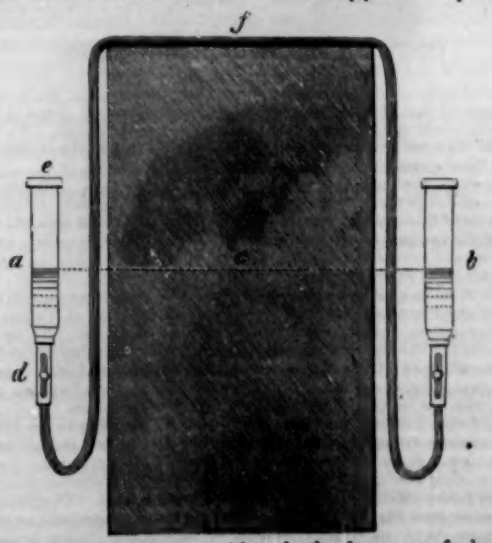
Its properties and mode of use are as follows:—Suppose, for example, the angle of elevation of a hill is taken by some other instrument, such as a theodolite, and found to be 30 degrees, and the distance or hypothenuse 60 chains, the perpendicular height, as shown by the instrument, would be 30, and the horizontal distance 52. The instrument is not intended for purposes where great accuracy is required, but merely for the pocket in travelling. For mining agents it is very serviceable, as by the small compass attached to the instrument, the direction of the lode may be ascertained, and by the quadrant the underlie. Traverse dialling, or sailing, may also be worked into a straight course by it, using the perpendicular slide as a line of northing and southing, and the slide for easting and westing, deducting the lesser sum from the greater, and fixing the slide to the total sum of the northing or southing, then opening the instrument until the edge of the other part meets the sum of the easting or westing; the hypothenuse will be the distance, and the degree of the quadrant the bearing.

Foway Consols Mine, B. BROKENSHAR.
Feb. 12, 1840.

This instrument appears to be an improvement on the clinometer, or batter level, and we doubt not engineers and surveyors will find it of much service to them in the ready means it affords of solving, without calculations, many tedious problems, in which a near approximation, which this instrument only pretends to give, is sufficient.

BROWN'S HYDRAULIC LEVEL.

THIS useful and effective instrument is constructed on the principle of water finding its own level. Its construction and mode of use is exceedingly simple, and the results obtained from its judicious application correct. The instrument consists simply of two open glass



vessels, freely communicating with each other by means of a hose or flexible tube. Water being poured into one of the glass vessels, until the flexible tube is quite filled, and the glass vessels partly filled. will stand at the same height in both: this will be the case whatever length the connecting tube may be. Its use is exemplified in the accompanying engraving.

C is a wall, and A, F, B, the hydraulic level passing over it by means of its flexible tube: the surface of the water, A, B, shows the horizontal or level line on each side. Of course this instrument

will not act where the wall exceeds 34 feet—the height at which a column of water is balanced by the weight of the atmosphere. Great care is necesssary in expelling the air when filling the tube with water, otherwise the action of the instrument will be very imperfect. The thorough expulsion of the atmosphere is in fact the only adjustment required to this instrument, but on which its whole accuracy depends. The adjustment is performed by holding the two glasses, A and B, together vertically, and blowing into one glass, so as to disturb the column of water and expel the air bubbles remaining in the tube, which must be continued until the surface of the water in both glasses will stand exactly at the same height.

D is a stop-cock to confine the water in the tube when not in use, and also in passing one end of the level over a wall or building. E is a screw-cap to prevent the water running out when one end is depressed, but which will allow the atmosphere to act on the water.

The sub-engineers on the Great Western Railway are said to use the hydraulic level, with a 100 feet hose for laying down the rails, and other as extensive practical purposes. The inventor also asserts that it may be used advantageously in levelling operations for determining the profile of a country, in which case of course staves become necessary. We much doubt its efficiency in such a case; but are certain that if so applied a great loss of time would be incurred. Its chief use appears to be in the setting up of machinery, and all kinds of iron-work, in levelling the foundations of buildings, the setting of centerings, and all similar purposes. The hose, in which consists the improvement, is made in five-feet lengths, and screwed together, so that any required length may be obtained.

In our diagram, the glass vessels are placed at a little distance from the wall for the purpose of showing the instrument more clearly.

INSTITUTION OF CIVIL ENGINEERS.

Annual Report, 1840.

The twenty-first Annual Report of the Council will be found to contain much interesting matter connected with the profession. We have slightly abridged the report, owing to the crowded state of our columns, but nothing essential has been omitted.

The Council of the Institution of Civil Engineers, on resigning the trust confided to them by the last Annual General Meeting, solicit the attention of this meeting, and of all those who are interested in the welfare of the Institution, to the following Report on the Proceedings and on the state and prospects of the Institution at the close of this the twenty-first year of its existence.

The Minutes of Proceedings (observe the Council) have been printed at such short intervals during the Session as the abstracts of Papers and Minutes of Conversation would furnish sufficient materials. No one can turn over the Minutes of the last Session without remarking the number and the diversity of the facts and opinions there recorded, very many of which were elicited by the statements contained in some written communication, or casually advanced in the course of discussion.

The Council cannot omit this opportunity of insisting on the importance of these discussions, in promoting the object which the Institution has in view. It would be easy to select many instances, during the last and preceding Sessions, of some of the most valuable communications to the Institution owing their origin entirely to this source. The first communication from Mr. Parkes arose entirely out of the conversations which took place on the superior evaporation of the Cornish Boilers being referred to as one cause of the great amount of the duty done by the Cornish Engines. The communication by Mr. Williams, on peat and resin fuel, owes its origin to his being accidentally present at the discussion on the uses of turf in the manufacture of iron: whilst that by Mr. Apsley Pellatt, on the relative heating powers of coke and coal in melting glass, arose entirely from the discussion of the facts stated by Mr. Parkes, respecting the superior evaporation produced by the coke from a given quantity of coal than by the coal itself. And, lastly, the extremely interesting and highly valuable discussions at the commencement of last Session on the uses and applications of turf; and on the extraordinary coincidence between the results obtained by Mr. Lowe, Mr. Parkes, Mr. Apsley Pellatt, and Marcus Bull of Philadelphia, experimenting as they did with totally different views, and under totally different circumstances, must be fresh in the recollection of all present.

The Council have endeavoured from time to time to direct attention to subjects on which it was conceived communications were needed or desirable, by proposing such subjects as objects for the Premiums placed at the disposal of the Council by the munificence of the late President. The communications sent in compliance with this invitation have not been numerous. Two, however, one by your associate Mr. Jones, on the Westminster Sewage, and the other by Mr. Hood, on Warming and Ventilating—seemed to call for some special mark of distinction.

The communication by Mr. Jones is of the most elaborate and costly description. It consists of a large plan of the city of Westminster, drawn to a scale of one inch to 200 feet, compiled from the originals in the possession of the Commissioners of Sewers of that district. Upon this are laid down the boundaries of the city, and parishes, and all the principal streets and squares, with the main and collateral lines of sewers, differently coloured, so as to be readily distinguished. This, with the Book of Sections, consisting of upwards of 100 sheets of tables and drawings of details of levels, lengths, and construction, furnishes an exact and authentic record of a work of great magnitude. Any extended remarks on the benefits conferred on our metropolis by the system of underground drainage, would be here superfluous. Works of this nature are of the highest public importance, and have been repeatedly the subject of legislation by both general and local acts. The Council conceived that, in awarding to Mr. Jones a Telford Medal in Silver and Twenty Guineas for this laborious communication, they were bestowing a suitable mark of approbation on the Author of a record which is nearly unparalleled, and must be of great value as a source of information in all future works of this nature, when other, and particularly foreign, cities carry into effect a system of drainage, in which they are at present so deficient.

The communication by Mr. Hood contains a detailed account of the principles on which the salubrity of the atmosphere in crowded rooms depends, and the various methods which have been adopted for warming and ventilation. The author has briefly touched on the various modes of warming generally adopted, and points out the great difficulty which exists of preserving those conditions of the atmosphere which are essential to healthy respiration wherever close stoves or surfaces which may become too highly heated are employed. The importance of ventilation, and the success which has attended the adoption of mechanical means in the manufacturing districts, are subjects worthy the attention of all who study the health of those who, from choice or necessity, are exposed to the generally unwholesome atmosphere of crowded apartments. This subject is of the highest importance to the manufacturing poor of this country, who are compelled to work in crowded rooms at high temperatures. The Council are aware that much has been done towards this object in some of the large cotton works of Great Britain, and they hope ere long to obtain some detailed account of the means by which this has been accomplished, and the results which have ensued.

The Council have also awarded a Telford Medal in Silver to your Associate, Charles Wye Williams, for his communication on the Properties, Uses, and Manufacture of Turf, Coke, and Peat Resin Fuel; and to Mr. Edward Woods, for his communication on Locomotive Engines.

The various applications of Peat as a fuel had been repeatedly the subject of discussion at the Meetings of the Institution; and the attention of Mr. Williams, as manager of the City of Dublin Steam Packet Company, has been for many years directed to the application of Peat or Turf as a fuel. Public attention was more than thirty years ago directed to this subject by Mr. Griffiths, who designated the bogs of Ireland as "mines above ground." The scarcity and cost of coal, as contrasted with the abundant supply and cheapness of peat, had long since led to the use of the latter in the steamers on the Shannon. Its bulk and tendency to absorb moisture are, however, serious impediments to its use; but these may be successfully combated by care in the preparation. Moreover, the peat, properly selected and prepared, being a carbon of great purity, is superior to every other substance for all purposes of metallurgy. But, in these researches, Mr. Williams had ulterior objects in view. He sought, by the preparation of an artificial fuel, to form a combination which should closely resemble the best kinds of natural coal, by combining with turf, coke, resin, or some other bitumen of great purity, so as to produce a compound in which great heating power should exist in small bulk, and thus avoid the excess of bitumen and deficiency of carbon in the cannel coal, as well as the deficiency of bitumen and excess of carbon in the anthracite.

The communication by Mr. Edward Woods, published in the Second Volume of the Transactions, will always bear a prominent place among the records of practical science, as one of the earliest and most accurate details on the actual working of Locomotive Engines. The first communication was received early in the Session of 1838. The Author was thought capable of adding so much to his already valuable commu-

nication, that the council referred it back to him for this purpose, and it was not received in the form in which it appears in your Transactions till after the premiums for that Session were awarded. But this communication (notwithstanding the interval since it was laid before the meeting) will probably be fresh in the recollection of most present, from its giving an accurate account of the progress of the Locomotive Engines on the Liverpool and Manchester Railway from the opening of that important work. The experience of Engineers had at that time furnished them with but little knowledge as to what were the most essential requisites in Railway Engines, and the advance of knowledge, as shown by the history of the Locomotive Engine on this railway, is a most interesting and instructive lesson to every one who would study the progress of practical science and improvement. Great alterations were found necessary in the strength of the parts, in the weight of the engines, in the road, and the number of wheels. The first engines were gradually adapted to the necessities of the case, and the arrangements then resorted to as necessary expedients have now been adopted into the regular and uniform practice. Besides the extreme interest of that which may be termed the history of these improvements, the communication is replete with theoretical principles as to the working of Locomotives, and the advantages and disadvantages incident to peculiar practical adaptations. It would exceed the limits of this Report to do more on the present occasion than briefly to state that this paper contains extended remarks on the relative advantages of four or six wheels, of inside or outside framings, of crank axles or outside crank pins, of coupled or uncoupled engines. The Council would point out this paper to the junior members of the profession, as an example of how great a service may be rendered by simply recording what passes under their daily observation and experience.

The Council have also adjudged a Telford Medal in Bronze and Books to the value of Three Guineas to Mr. R. W. Mylne, for his communication on the Well sunk at the reservoir of the New River Company at the Hampstead Road; to Lieutenant Pollock, for his drawings and description of the Coffer Dam at Westminster Bridge; and to Mr. Redman, for his drawings on account of Bow Bridge.

The communication by Mr. Mylne contains an account of the various attempts which have been made in the metropolis and its environs to obtain water from the sand strata, by means of wells and small bores, in which the water rises naturally to the surface. These attempts, and the raising the water by artificial means from the sand strata, have been for the most part unsuccessful. In some cases, parties having communication with the same sand stratum and contiguous to each other, were unable to obtain water at the same time, as the drawing water by one had the effect of destroying the supply of all the others. In other cases, the sand coming away with the water, large cavities were formed of such a nature as, after a short time, entirely to suspend the progress of the works. Of the latter difficulty, some remarkable instances occurred during the sinking of the well in the Hampstead Road, which are particularly described in the communication. The supply of water from the sand being, from the causes just alluded to, very precarious, the New River Company, in March, 1835, determined on sinking a well through the clay and sand into the chalk, for the purpose of ascertaining the supply of water from this source. The peculiar difficulties experienced in the progress of this work, and the means by which these and similar difficulties are to be overcome, as set forth in the report of Mr. Simpson, appended to the communication, furnish a valuable compendium of information on this subject; and, being replete with practical details of an executed work of no ordinary difficulty, is one of those communications to which the Council are most anxious to give every encouragement in their power.

The communication by Lieutenant Pollock on the Coffer Dam now fixed round the 13 and 14-feet piers of Westminster Bridge, and by Mr. Redman on the New Stone Bridge over the River Lea at Stratford-le-Bow, are of a similar character with the preceding; they are both accurate accounts, accompanied by valuable drawings, of important works actually executed.

Among the other communications of the Session, the Council cannot, on the present occasion, omit to notice those of your Member Mr. Parkes. His communication on the Evaporation of Water from Steam Boilers, for which a Telford Medal in Silver was awarded during the preceding Session, and the interesting discussions to which it gave rise, are too well known to require comment. But, great as were the benefits conferred on practical science by the facts there recorded, they have been much surpassed by the subsequent labours of this author. In continuation of his subject, you received early in the Session the first part of a communication on Steam Boilers; and at the close of the Session, the second part, treating of Steam Engines. Before Mr. Parkes was induced to turn his attention to the preparation of these communications, no attempt had been made to bring together, in one connected view, the various facts which had been ascertained. The economy of the Cornish system was indisputable; but to what it was to be referred was involved in some obscurity. It was reserved for this communication to call attention to certain quantities and relations which exerted a peculiar influence over the results; and which, being rightly ascertained, were at once indicative or exponential of the character of the boiler. If it be found that, in one class of boiler, the same quantity of coal is burnt eight times as rapidly as in another class—that the quantity consumed on each square foot of one grate is twenty-seven times that on the grate of another—that the quantity of water evaporated bears some definite relation to the quantity of heated surface—and that there is twelve times more evaporated by each foot of heated surface in one class of boiler than in another—and finally, that the quantity of water evaporated by a given weight of fuel is in one class double the quantity evaporated in another,—we have arrived at some definite relations whereby to compare boilers of different kinds with each other. To these definite quantities and relations, the author, with apparent propriety, assigns the term "exponents;" and these being compared together for different boilers, their respective merits as evaporative vessels are readily perceived. Mr. Parkes has also called the attention of engineers to the effect of the element time, that is, the period of the detention of the heat about the boiler. The importance of attending to this cannot be too strongly insisted on; as it would appear from these statements, that boilers being compared, with each other, in respect of their evaporative economy, are nearly inversely as the rate of combustion. Attention is also called to the fact, that there are actions tending to the destruction of the boiler entirely independent of the temperature of the fire, and which may be designated by the term "intensity of calorific action." Of their nature we know nothing, but the durability of different boilers, under different systems of practice, affords some means of comparing the intensity of these actions.

Mr. Parkes having, in the first part of the subject, thus pointed out the distinctive features of the different classes of boilers as evaporative vessels, proceeds, in his subsequent and concluding communication, to consider the distribution and practical application of the steam in different classes of steam engines. And, for this purpose, he is led to consider the best practical measure of the dynamic efficiency of steam—the methods employed to determine the power of engines—the measures of effect—the expenditure of power—the proportion of boilers to engines—the standard measures of duty—the constituent heat of steam—the locomotive engines—the blast and resistance occasioned by it—the momentum of the engine and train, as exhibiting the whole mechanical effort exerted by the steam—the relative expenditure of power for a given effect by fixed and locomotive non-condensing engines. This bare enumeration of the principal matters in the second communication will give some, though a very inadequate, idea of the magnitude of the task undertaken by Mr. Parkes; for the communication is accompanied by elaborate and extensive tables, exhibiting the results of the facts which he has collected and used in the course of his inquiry, and it may confidently be asserted that a more laborious task has rarely been undertaken or accomplished by any one individual than the series of communications thus brought before the Institution.

It will be one of the earliest duties of the succeeding Council, to consider in what manner the sense of the great benefits conferred on this department of practical science can most appropriately be testified.

It would be vain to expect that an annual meeting should ever recur without the Council having to lament the removal by death of some who, by their acquirements, or by their associations of friendship, were endeared to the Institution. On the present occasion the Council have to lament the removal by death of your members, Mr. David Logan and Mr. Henry Habberley Price, and of your Honorary Member, Mr. Davies Gilbert. The records of the Institution contain several communications from Mr. Logan, particularly one on the new graving dock at Dundee, and Mr. H. H. Price was, when in town, a constant attendant at the meetings, and took a lively interest in the proceedings and success of the Institution. Mr. Davies Gilbert was, by his writings and his influence, a great benefactor of practical science, and the transactions of the Royal Society, over which he presided for three years, contain several papers of great value to the practical engineer. He took great interest in the introduction of Mr. Watt's improvements in the steam engine into the Cornish mines, and in the controversy betwixt Mr. Watt and Mr. Jonathan Hornblower respecting working steam expansively, the former employing one cylinder only, the latter two cylinders, in the manner afterwards revived by Woolf; the theoretical efficiency at the two methods being identical, but simplicity and mechanical advantage being greatly in favour of the former, as its present universal adoption testifies. Mr. Davies Gilbert introduced into practical mechanics the term "efficiency" as the product of the applied force and of the space through which it acted, in contradistinction to the term "duty," as

indicative of a similar function of the work performed. His attention was also directed to the theory of suspension bridges, when the plan for making such communication across the Menai was submitted to the Commissioners appointed by Parliament. It appeared to him that the proposed depth of curvature of the catenary was not sufficient, and his well-known theoretical investigation of this subject was undertaken with the view of ascertaining this fact; and in consequence of these investigations, the interval between the points of support of the chains and the roadway was increased to the height which appeared to him requisite for works of this nature. The labours of this distinguished individual for the promotion of science were unremitting. He was the founder of several societies; he was the discoverer and early patron of the talents of Davy; and while in parliament he laboured most assiduously in the advancement of all the public works. Regret for such a man, exerting the power of his mind so advantageously and through so many years, must always be strong and sincere; but having attained the ordinary limit of human life, he sunk into the grave amidst the respect and esteem of all who knew him, and has left behind him a name which will ever bear a prominent place amidst the names of those whose lives and talents have been devoted to great and noble purposes.

RECORD OF PUBLIC WORKS.

PORTREATH HARBOUR.—Such a tremendous ground sea has been experienced throughout the middle of the past month, that no vessels have been able either to enter Porthreath or to leave it: the surf have been more violent than ever remembered. Yet we have smooth water in the basin, which is effectually secured by the large balks of timber with which its entrance is closed upon such occasions; and the vessels ride not only in safety, but even without straining their ropes.

THE THAMES TUNNEL.—This stupendous undertaking progresses fast towards completion. The excavators reached low water mark on the Middlesex shore a month or two back. Since that time their progress has been much more rapid, they having often accomplished upwards of 20 feet per week. They are now within a very short distance of the bank, and it is expected that in two months' time the whole will be completed. The carriage way will be by a circular road, and the approach for foot passengers by flights of stone steps. Property in the neighbourhood of the tunnel has already improved nearly twenty per cent. The tunnel will be open for pedestrians at least a year before it will be ready for horses and carriages.

THE STOCKPORT VIADUCT.—This wonderful undertaking of the Manchester and Birmingham Railway Company, in this borough, is proceeding sufficiently fast to realize the perfection of it within the term of the contract, notwithstanding the difficulties which have twice attended the progress of the river arch. All the arches, except one, on the Lancashire side, are turned, so that 10 of the 63 feet arches may be said to be almost completed; whilst the stone piers for two others, on the Cheshire side, are ready to receive the superstructure of the brick work for the two small arches at the extremity of the viaduct, like those at the Lancashire end, is rapidly proceeding to a termination. Twelve of the 26 arches may, therefore, be said to be pretty well out of the hands of the workmen, and another six months will see the perfection of one of the most gigantic productions of art of a similar character in this kingdom.—*Stockport Advertiser.*

A RAILWAY is projected from Gloucester into the coal districts of the Forest of Dean. Captain Moorsom, the able engineer of the Gloucester and Birmingham railway, is, we believe, at present engaged in making a survey of the country through which it is proposed the line alluded to shall pass.

THE Worcester Chamber of Commerce have authorised Mr. Varden, the engineer, to continue the sectional surveys for the projected line of railway from Worcester to Port Dynllaen, in North Wales; and have declared an intention of persevering in their endeavours to complete the undertaking. The plans and specifications of 70 miles, it is stated, will be deposited in London before the 1st of March.

NEW LINE OF ROAD.—Application will be made in the present session of Parliament for a new turnpike road from Southport to Liverpool, through Birkdale, Ainsdale, Formby, Crosby, &c., in a direct line which will not exceed 15 miles. This will be of great service to this rapidly improving bathing resort, and will also benefit and improve the several townships which it will intersect.

A NEW light-house has been for some time past in course of erection on St. Catherine's Point, in the Isle of Wight, and is now nearly completed. The light will burn at an elevation of 178 feet above the level of high water, and will appear as a fixed bright light in all directions seaward.

PORT FLEETWOOD.—A first class steam-dredge, of upwards of 100 feet in length, and adapted to lift 300 tons of submarine matter per hour from 17 feet below the water line, was launched at Port Fleetwood, a few days since. This substantial vessel has been built at Fleetwood-upon-Wyre, by Mr. Speakman, under the directions of Captain Denham, F.R.S., consulting marine surveyor for the Wyre harbour improvements.

THE water along the courses of the Ouse and the Cam has been exceedingly high, inundating many thousand acres, entirely putting a stop to navigation, and in many parts of the Fens doing great injury.

DOVER harbour was stated to have been blocked up so much with shingle for twelve days during the past month, that the mail packets were not able to get in or out.

PUBLIC WORKS IN INDIA.—The Governor-general has turned his attention to internal improvement on a grand scale. It is in contemplation to effect a junction of the two rivers, Jumna and Letledge, for which purpose, Captain Baker is employed taking levels to ascertain the practicability of constructing a navigable canal between the two rivers. —*Bombay Courier*, Nov. 5.

PENZANCE HARBOUR.—It is in contemplation to construct a new harbour at this place; upon which subject, Mr. Palmer, C.E., has made a preliminary report to the council of the borough. The harbour-scheme is stoutly resisted by a numerous and influential party in the neighbourhood, who wish to have a breakwater in Mounts bay, which, they allege, would form a far more valuable and secure refuge for shipping than the harbour. Captain Taylor's plan of a floating breakwater seems to meet with general encouragement, and the inhabitants appear inclined to support the experiment.

THE Lowestoft Navigation, which was put up to auction last week, was bought in at 14,000*l.*, no person making an adequate bidding.

BRANCH RAILWAY TO CONNECT THE HIGH PEAK WITH THE NORTH MIDLAND.—A survey of this line of railway is now completed, and application is intended to be made to Parliament next session for its formation. It is to join the North Midland line at Amber Gate, at which place there will be a first class station; from thence the line winds along the course of the river Derwent, and forms a junction with the High Peak railway at Cromford. The length of the line is about 4 miles. The delightful village of Matlock will then possess the advantage of a direct railway communication with London and most of the principal towns.

SHEFFIELD AND ROTHERHAM RAILWAY.—We understand there will be placed upon this railway in a few days, an engine patented by a gentleman of this town, which possesses many advantages over any other. All the six wheels are connected by a strap either of hemp or leather, thereby presenting six points of adhesion or friction to the rails instead of two, which will secure an uniformity of speed in all weather. It is expected to move double the weight at the same velocity to any other engine of same weight and capacity of cylinder. It will also greatly diminish the expenses of repairing the road; for each of the engines now in use weighs, when the boiler is charged with water, twelve tons, nearly the whole of which (to ensure progressive motion,) is placed upon two driving wheels. But the patent engine having the weight divided equally upon each wheel, (every one being a driver,) it is obvious that the one engine is striking the rail with a twelve ton hammer, whilst the other is gently tapping it with four. Not only great speed, but great regularity also are expected from railways, both of which will be ensured by this simple but sound invention. It will also acquire its speed, and be stopped sooner than the other engines.—*Sheffield Iris.*

RECORD OF PUBLIC BUILDINGS.

DESIGN FOR THE "TAYLOR INSTITUTION," OXFORD.—In a convocation holden on the 13th February, Mr. Cockerill's plan for the Taylor Institution for modern languages was adopted by a majority of 22 to 20. In a convocation to be holden on some subsequent day, it will be proposed to nominate a delegacy, to carry into effect the plans for the erection of the Taylor Building and the University Galleries, with powers to arrange the contracts with builders, &c. The contracts must be submitted in convocation for the University Seal.

AN extensive chapel, in Ebrington Street, Devonport, has just been completed by a body of dissenters, who style themselves "Christians." In consequence of their increasing numbers, about two years since, they considerably enlarged their chapel in Raleigh Street; but that building being now found insufficient to contain their numerous followers, the chapel in Ebrington Street has been erected. The appearance of the new chapel partakes of the singularities of the sect—the general characteristics of the building being quite different from anything before seen in the West. The front towards Ebrington Street presents a simple, but bold and not inelegant appearance—surmounted by a pediment which adds considerably to the effect of the front. There are also two projecting door-ways, at each extremity of the front, of a plain but neat appearance. From the Ebrington Street front line, this building forms a regular figure of seven sides, presenting on entering, almost a semi-circular appearance. The arrangements of the interior (which is very capacious, calculated to contain upwards of 1000 people,) are singular in the extreme. In the centre and lowest parts of the chapel a table is placed, from which the

seats rise on every side in amphitheatrical form. There are no pews, all the seats being open; nor are there any galleries. No ornamental work of any description is to be seen; in fact, a degree of rigid plainness has been studied in the interior arrangement, and from the absence of a pulpit also, a large number of the congregation are necessarily placed behind the speakers.

A new church is about to be built at Jefferies Hill, Hanham, about three miles from Bristol, from the designs of Mr. Thomas Foster, of Bristol.

The foundation stone of a new Roman Catholic school and chapel, was laid a few days since, at Alton Towers, near the splendid seat of Lord Shrewsbury. It is to be erected entirely at the expense of the noble earl.

Active exertions are making to raise funds for the erection of a new church at Cadoxton juxta Neath, a parish containing a population of 10,000 souls, with only church-room for 600.

Exeter Diocesan Church Building Society.—At the quarterly meeting of the Committee of this most valuable society, held in the course of the past month, the following grants were made: 15*l.* towards providing increased church accommodation at Thorverton, 75*l.* towards the erection of a new chapel at Port Leven, in the parish of Sithney, and 500*l.* towards the erection of a new church in the parish of St. Andrew, Plymouth.

The country residence, which is at present being built for the Bishop of Exeter, is so far advanced as to enable even a superficial observer to perceive that, when completed, it will be quite unique. The situation of the house is extremely romantic, overlooking Ansty's Cove, on the road from Torquay to Babicombe. The style is that of an Italian villa. It is universally admired, and certainly reflects great credit on the professional taste and skill of Mr. Gribble, the architect, who shows himself equally at home in this as in that of the elegant mansion (in the Tudor style,) now erecting and nearly completed under his directions, at Kingskerswell, for H. L. Browne, Esq.

The Fitzwilliam Museum. — The Fitzwilliam Syndicate have reported to the senate "that Mr. Basevi has certified to the Vice-Chancellor that Mr. Baker has executed works in the building of the Fitzwilliam Museum to the value of 34,000*l.*, or thereabouts; and Mr. Basevi has thereupon recommended that a sum of 5,000*l.* be now paid to Mr. Baker on account of the said works, in addition to the sum of 25,500*l.* already paid to him on that account. That although the above-mentioned sum of 5,000*l.* exceeds the instalment which Mr. Baker is at present entitled to demand according to the terms of the contract, the Syndics, under the circumstances stated in Mr. Basevi's certificate and letter, beg leave to recommend to the Senate that the said sum be paid to Mr. Baker, provided that he is willing to agree that the balance to be retained by the Vice-Chancellor until six months after Mr. Basevi shall have duly certified the entire completion of the works, shall, according to the terms of the contract, be not less than 10 per cent. upon the whole amount of the contract; and that Mr. Baker's sureties are willing to agree that the payment of the sum of 5,000*l.* as above proposed, shall not affect or impair their present liability under the contract." The Syndics further recommend that Mr. Basevi be authorized to order the execution at a cost not exceeding 1,000*l.*, of certain works at the Fitzwilliam Museum not included in Mr. Baker's contract; it being advisable that such works should be completed previously to making any further contracts for the finishing of the building.

Margate. — It is in contemplation to erect new baths and make various improvements in the Royal Sea-bathing Infirmary, with the money (1,000*l.*) bequeathed to that philantropic institution by the late Mrs. Kidman.—*Kentish Gazette.*

The government have granted 2,000*l.* towards building a new post-office at Aberdeen.

Effect of Railways on Architecture.—A completely new town is in the course of formation between the old corporation town of Kingston-upon-Thames, (Surrey) and the South Western Railway, and already nearly 200 beautiful houses and snug villas are finished, or in the course of finishing. In anticipation of the traffic expected to arise from the vicinity of the railway to Leicester, three lines of streets have been already laid down from Morledge-street (Humberston Road) and Northumberland-street, and partially built upon. The works have been interrupted by the late rains, but, notwithstanding, are sufficiently forward to enable the projectors to complete all by the time the railway opens. Such of the houses as are finished are commodious, and in good style, and will, no doubt, be very desirable as a residence, for the air in this quarter is considered very pure.

Designs for a new building for the purposes of a Savings Bank, at Bath, are wanted by the 10th of March. Particulars of the contemplated structure may be obtained at the present Savings Bank, Trim Street, Bath.

It is in contemplation to erect a new Hospital for East Somerset, at Shepton Mallet.

A new church is about to be erected at Shaftsbury, on the site of the church of the Holy Trinity, which is become too delapidated for repair or further use.

New Town Hall at Oldham. — Workmen are at present busily engaged in preparing to lay the foundations of the Oldham Town Hall. The principal contract, that for joinery, has been let to Messrs. Birtwisle and Son, of Bury; the masonry to Mr. Joseph Scholes, and the brickwork to Mr. James Wrigley, both of Oldham. The erection, which will cost in building about 4000*l.*, is to be from a design of Mr. Joseph Butterworth, of the firm of Messrs. Mills and Butterworth, architects, Manchester.

It is proposed in Edinburgh to erect a monument to Napier, the inventor of Logarithms.

York Minster.—It is reported that the gang of masons that has been for so long a period employed, under the most able superintendence, in keeping the fabric of York Minster in repair, has been broken up; and that this noble building, the pride of Yorkshire, and the admiration of the world, is abandoned to the fatal ravages of time. It is painful to observe the barbarism of the Dean and Chapter in allowing the wretched pailing to remain, by which the church is in part surrounded; in the increase of buildings close to the nave; in the houses both of stone and brick on the south and west side of the church; and in the horrible desecration on the south side between the choir and the chapter-house.

MISCELLANEOUS.

As the trigonometrical survey of Ireland is now drawing to a close, arrangements are in progress for beginning that of Scotland; for this purpose the whole establishment under Colonel Colby, will be transferred to Scotland as soon as the survey of Ireland is completed.

Tithe Appointments. — Great inconvenience and delay has been experienced in apportioning the rent charge, fixed by agreements, in consequence of the attempt to obtain first class maps. It seems reasonable that the tithe commissioners should require proof that these maps are really correct before they affix their seal, which acts as a certificate of accuracy and makes them legal evidence, but experience shows that the difficulties of constructing a map with the required accuracy in hilly, thickly wooded, and enclosed counties, are so great, that in the vast majority of cases, the maps sent to the tithe office have failed under the examination to which they have been submitted. Under these circumstances, we think landowners would find their advantage in adopting second class maps. We understand the commissioners reject no maps or plans which are satisfactory to landowners.

Foundations.—In preparing a vault a few days ago in the churchyard of Stoke Lacey, Herefordshire, a *running sand* was discovered about five feet below the surface, in consequence of which the foundations of the chancel gave way, and the entire wall fell down, carrying the eastern window in its descent.

Irish Coal Mines.—The extensive coal fields of the county Antrim, situate on the sea coast, have been recently let, by order of the Court of Chancery; and a company is being formed, with a capital suitable to their development. The seams are nine feet in thickness, and of excellent and bituminous quality. They extend over 7,000 acres, and promise a complete supply to the city of Dublin, and to Belfast, Londonderry, Dundalk, and the whole north-eastern and western portions of Ireland. The mineral resources of Ireland are, now happily, beginning to be appreciated; and every well-wisher of the country must desire, as we do, the most complete success to the enterprise.

Specifications—Importance of Punctuation.—A famous blunder occurred in the contract for lighting the town of Liverpool, in the year 1819, the words of which were—"The lamps to be in number 4,050, of two spouts each, composed of twenty threads of cotton." The contractor would have proceeded to furnish each lamp with the said twenty threads, but this being but half the usual quantity, the commissioners discovered that the difference arose from the comma following instead of preceding the word each. The parties had to annul the contract to prevent a law suit. We could name some recent instances where contracts have been set on one side from a similar circumstance.

That part of the mountain in the Jura, called the Cernans, slipped on the night of the 29th ult. to the extent of 200 yards, and fell into the chasm below. That part of the road between Dijon and Pontarcer, which ran over it, called the Rampe de Cernans, sank upwards of 50 yards, and is impassable from Salins to the boundary of the Doubs. This accident is attributed by some to the removal of stone and gravel at the base, for the repair of the road, and others to the undermining of a subterranean spring.

At Perranzabuloe, in Cornwall, a parish church, which has been buried in the sand for 700 years, has lately been discovered.

There has happened a very large fall of the cliff adjoining the Shakspeare of 600 feet in length, and from 40 to 50 feet in depth from the

summit, being at the least 400 feet in height, and at the bottom the chalk covers at least acres of the beach below. It has fallen on the direct line of the railway, and much labour will be required to move it.

Among the advantages of railway travelling, we may mention the fact, that more than one fishmonger in Leamington receives a supply of fish by 11 o'clock in the forenoon of every day, purchased at Billingsgate, London, on the same morning.—*Leamington Gazette.*

On the 5th ultimo, a Dundee steam-ship, on her way down the river, about 10 in the morning, the tide having nearly run out, grounded upon the Thames-tunnel, creating the greatest alarm both for the safety of the vessel and the arch of the tunnel. About an hour after grounding, she floated off, and proceeded on her voyage, without, it is believed, having sustained any serious injury. The crown of the arch is not supposed to be injured, although the workmen in the tunnel state that they could hear her grating along the top of it.

The first cargo of stone for the new houses of Parliament, from the quarries of Anston, has been shipped from the Chesterfield canal company's wharf at Stockwith, by W. A. Cartwright, the agent, in a fine sloop called the Spring Rice, Captain Gringle, 130 tons burden. Several other vessels are engaged by Mr. Cartwright for the same service.

LIST OF PATENTS GRANTED DURING FEBRUARY.

It has been, again and again, remarked to me, that the mere list of patents, which can be had in every journal of compilation, is unworthy of "The Surveyor, Engineer, and Architect," and I agree in the opinion. If, therefore, I can in any way effect its accomplishment, it is my intention, in the future numbers to postpone the patents for a month, in order that a "catalogue raisonnee" of their merits and demerits may be given; and that the public may be enabled to draw the line of distinction between works or inventions of real merit, which the parties, not very wisely, perhaps, seek to secure by patent; and the major portion—the rubbish which are patented by way of puffs and gross and nefarious impositions upon the public,—for which the present state of our patent laws sets the door shamefully wide. ROBERT MUDIE.

To Moses Poole, of Lincoln's-inn, gentleman, for improvements in pumps for raising and forcing water and other fluids, being a communication.—Sealed 30th January—Six months for inrolment.

William Brockedon, of Queen-square, Middlesex, Esq., for improvements in the means of retaining fluids in bottles, decanters, and other vessels.—Sealed 31st January—six months for inrolment.

Philippe Marie Moindron, of Bedford-place, Russell-square, merchant, for improvements in the construction of furnaces, and in boilers, being a communication.—Sealed 31st January—six months for inrolment.

William Cubitt, of Gray's-inn-road, builder, for an improvement or improvements in roofing.—Sealed 31st January—six months for inrolment.

Crofton William Moat, of Thistle grove, Brompton, Esq., for a new and improved method of applying steam power to carriages on ordinary roads.—Sealed 5th February—six months for inrolment.

Wilkinson Steele, and Patrick Sanderson Steele, manufacturing and furnishing ironmongers, of George-street, Edinburgh, for improvements in kitchen ranges for culinary purposes, and apparatus for raising the temperature of water for baths and other uses.—Sealed 5th February—six months for inrolment.

William Isaac Cookson, of Newcastle-upon-Tyne, Esq., for certain improved processes or operations for obtaining copper and other metals from metallic ores.—Sealed 5th February—six months for inrolment.

Thomas Myerscough, of Little Bolton, Lancaster, manager, and William Sykes, of Manchester, machine-maker, for certain improvements in the construction of looms for weaving or producing a new or improved manufacture of fabrics; and also in the arrangement of machinery to produce other descriptions of woven goods or fabrics.—Sealed 5th February—six months for inrolment.

Samuel Carson, of Caroline-street, Coles-hill, Eaton-square, gentleman, for improvements in apparatus for withdrawing air or vapours.—Sealed 5th February—six months for inrolment.

Joseph Needham Taylor, of Plymouth, a post captain in the royal navy, for improvement in steam boats and vessels, making applicable the power of the steam engine to new and useful purposes of navigation.—Sealed 8th February—six months for inrolment.

John Wertheimer, of West-street, Finsbury-circus, printer, for certain improvements in preserving animal and vegetable substances and liquids, being a communication.—Sealed 8th February—six months for inrolment.

Robert Beart, of Godmanchester, miller, for improvements in apparatus for filtering fluids.—Sealed 8th February.—six months for inrolment.

Amand Deplanque, of Lisle, in the kingdom of France, but now residing in Leicester-square, gentleman, for improvements in looms for weaving, being a communication.—Sealed 8th February—six months for inrolment.

Edmund Rudge, jun., of Tewkesbury, tanner, for a new method or methods of obtaining power for locomotive and other purposes, and of applying the same.—Sealed 8th February—six months for inrolment.

James Hancock, of Gloucester-place, Walworth, for a method of forming a fabric or fabrics, applicable to various uses, by combining caoutchouc, or certain compounds thereof, with wood, whalebone, or other fibrous materials, vegetable or animal, manufactured or prepared for that purpose, or with metallic substances, manufactured or prepared.—Sealed 8th February.—six months for inrolment.

George Eugene Magnus, of Manchester, merchant, for certain improvements in manufacturing, polishing, and finishing slate, and in the application of the same to domestic and other useful purposes.—Sealed 8th February—six months for inrolment.

Robert Willis, of the University of Cambridge, clerk, for improvements in apparatus for weighing.—Sealed the 12th February—six months for inrolment.

David Napier, of York-road, Lambeth, engineer, for improvements in the manufacture of projectiles.—Sealed 12th February—six months for inrolment.

Antoine Blanc, of Paris, merchant, and Theophile Gervais Bazille, of Rouen, merchant, for certain improvements in the manufacturing or producing soda and other articles obtained by or from the decomposition of common salt or chloride of sodium.—Sealed 12th February—six months for inrolment.

Thomas Robinson Williams, of Cheapside, gentleman, for certain imments in the manufacture of woollen, and other fabric or fabrics, of which wool or fur forms a principal component part, and in the machinery employed for effecting that object.—Sealed 14th February—six months for inrolment.

Joseph Clark, of Boston, printer, for improvements in pianofortes.—Sealed 14th February—six months for inrolment.

Gerard Ralston, of Tokenhouse-yard, merchant, for improvements in rolling puddle balls or other masses of iron, being a communication.—Sealed 22nd February—six months for inrolment.

Richard Cuerton, jun., of Percy-street, Middlesex, brassfounder, for improvements in the manufacture of cornices, mouldings, and window-sashes, being a communication,—Sealed 22nd February—six months for inrolment.

Thos. Kerr, of Forecrofts, Dunse, in the county of Berwick, Esq., for a new and improved mortar or cement for building; also for mouldings, castings, statuary, tiles, pottery, imitations of soft and hard rocks, and other useful purposes; and which mortar or cement is applicable as a manure for promoting vegetation and destroying noxious insects.—Sealed 22nd February—six months for inrolment.

William Cook, of King-street, Regent-street, coachmaker, for improvements in carriages.—Sealed 22nd February—six months for inrolment.

John Hanson, of Huddersfield, engineer, for certain improvements in meters for measuring volumes of gas, water, and other fluids, when passed through them; and in the construction of cocks or valves, applicable to such purposes.—Sealed 22nd February—six months for inrolment.

William Winsor, of Rathbone-place, artists' colourman, for a certain method or certain methods of preserving and using colours.—Sealed 22nd February—six months for inrolment.

Job Cutler, of Lady Poole-lane, Birmingham, gentleman, and Thomas Gregory Hancock, of Highgate, Birmingham, aforesaid, mechanist, for an improved method of cutting corks, and constructing the necks of bottles.—Sealed 22nd February—six months for inrolment.

William Brindley, of Northwood-street, Birmingham, for improvements in apparatus employed in pressing cotton, wool, and goods of various descriptions.—Sealed 25th February—six months for inrolment.

Thomas Huckvale, of Over, Norton, Oxford, farmer, for improvements in ploughs.—Sealed 25th February—six months for inrolment.

Thomas Farmer, of Gunnersbury House, near Acton, Middlesex, Esq., for improvements in treating pyrites to obtain sulphur, sulphuric acid, and other products.—Sealed 25th February—six months for inrolment.

John Wilson, of Liverpool, lecturer on chemistry, for an improvement or improvements in the process or processes of manufacturing the carbonate of soda.—Sealed 25th February—six months for inrolment.

Richard Kingdon, of Gothic House, Stockwell, surgeon, for certain improvements in apparatus or the support of the human body, and the correction of curvatures and other distortions of the spine of the human body.—Sealed 25th February—six months for inrolment.

Thomas Milner, of Liverpool, safety-box manufacturer, for certain improvements in boxes, safes, or other depositories, for the protection of papers or other materials from fire.—Sealed 26th February—six months for inrolment.

William Morrett Williams, of Bedford-place, Commercial-road, professor of mathematics, for an improved lock and key.—Sealed 27th February—six months for inrolment.